FIFTH ANNIVERSARY NUMBER

THE HEATING AND VENTILATING MAGAZINE

VOL. VI., No. 6 NEW YORK, JUNE, 1909 $1.00 a year, 10 cents a copy

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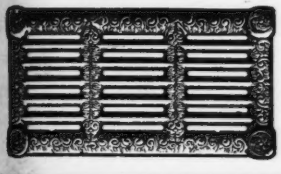

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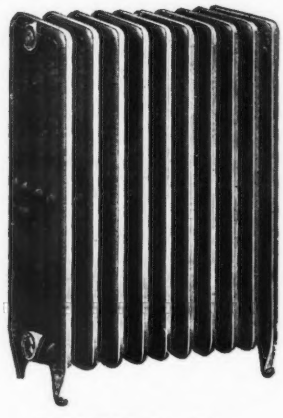

PRINCESS, Five Column

NATURAL VENTILATION

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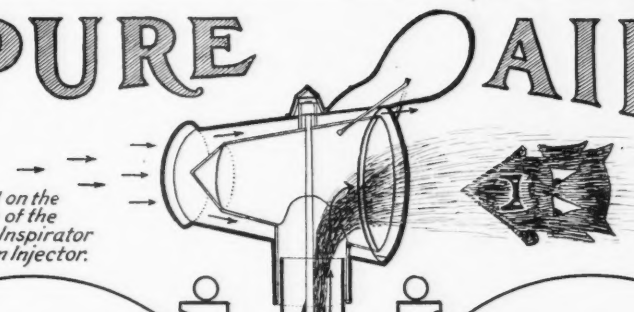

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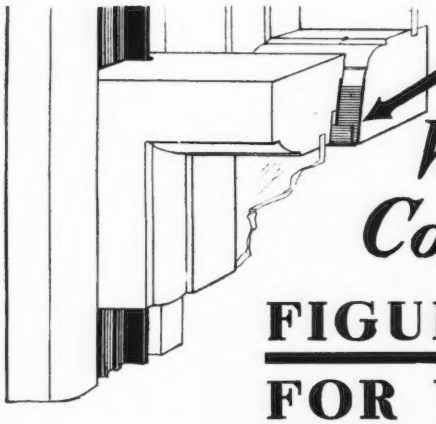

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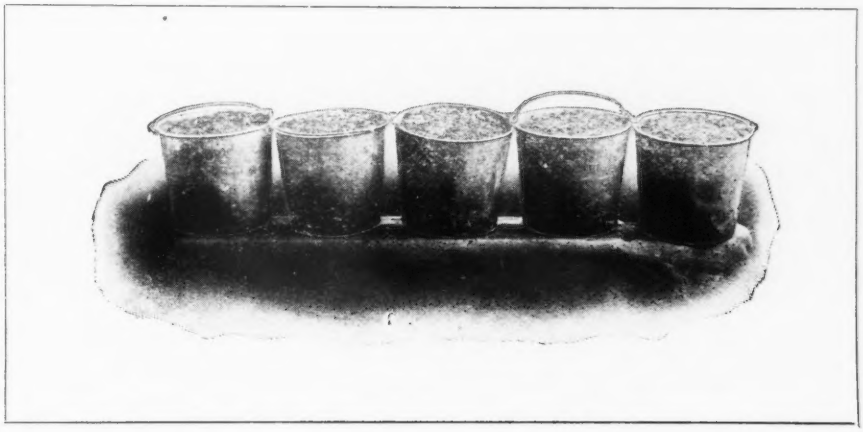

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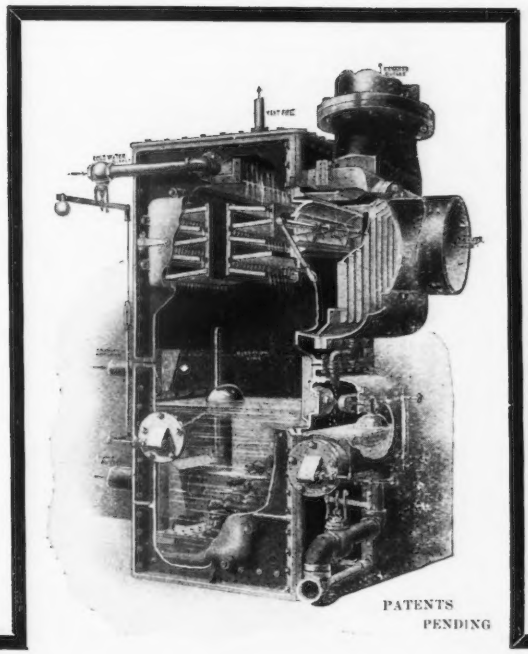

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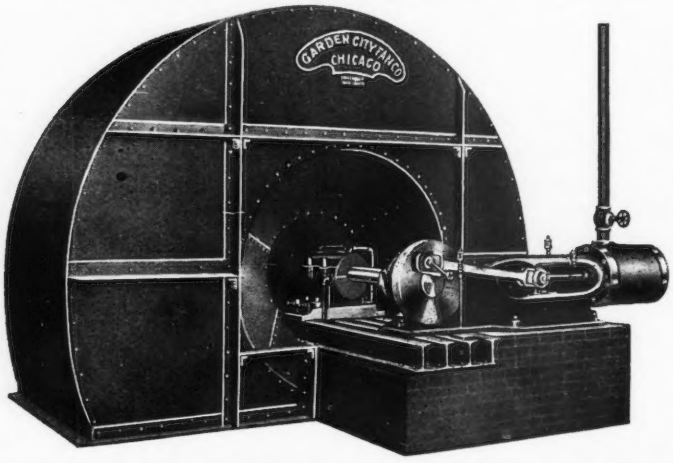

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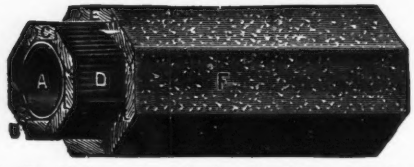

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(B) It is waterproof.

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The Heating and Ventilating Magazine

VOL. VI No. 6

Contents for June, 1909

The Heating and Ventilating Engineer of To-day
Wm. J. Baldwin 1

Tables for Ventilating Ducts. *Chouteau E. Pearce* - 5

Ventilating Scheme for a Hotel Building - - - 12
Secor Hotel, Toledo

Indirect System for Heating and Ventilating Railroad Coaches - - - - - - - - - - 18

Heating and Ventilating National City Bank, New York 22

New Method of Heating and Ventilating Prisons
John G. Eadie 34

Correspondence - - - - - - - - - - 38
Heat Emission from Radiators and Heat Losses from Buildings
Heat Transmission Effect of Solid Concrete Floors
A Word of Appreciation

New York's Proposed New Building Code - - - 39

The Weather for May - - - - - - - - 40
New York, Boston, Pittsburg, Chicago and St. Louis

Current Heating and Ventilating Literature - - - 40

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THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK JUNE, 1909

The Heating and Ventilating Engineer of To-day

A Review of a Comparatively Youthful Science and the Rapidity with Which It has Grown to Enormous Proportions

By WM. J. BALDWIN

WM. J. BALDWIN

EXCEPTING the engineering problems of electricity, no engineering problem has grown with the rapidity of warming and ventilating buildings. In the early days it differed from almost all other branches of engineering in that almost any man who knew how to cut pipe considered that he was competent to do heating, and as heating and ventilation nearly always go together in the engineering problem of a building, the artisan often tried his hand at ventilation.

The remembrance of thirty years ago is still fresh enough in the minds of many still active, but it is not necessary to go back thirty years to refresh our minds with instances of utter failures in what may be considered the simple mechanical problems of warming a building. Failures in ventilation are also numerous, but they are not so apparent as the failures in the steam problem or in the hot water problem.

Wonderful improvements, however, have been made within the last twenty or twenty-five years in the construction of warming and ventilating apparatus, the magnitude of which has been so great, compared with all that was done previously, that I am of the opinion I do not err when I make the broad assertion that the art of heating and ventilating buildings is to-day an "exact science," and that results can be calculated and foretold with a degree of accuracy comparable with any other well developed branch of engineering.

The writer has been with this development for forty years. He remembers when the usual method of piping a building was to start from the boiler and run a steam pipe on a slightly upward incline to its various branches, thence vertically to the radiators; returning the water of condensation in the same manner by another series of pipes differing only in diameter from the steam pipes.

Most persons imagine that somewhat similar methods are followed to-day. When this is now done, it is the exception, and, when it is done, it is always the work of someone who has taken on himself the problem without proper preparation or consideration. Such a person is almost sure to follow the same line of thought as the man of thirty-five or forty years ago, and, like the man of that time, produces something that leaves a lasting impression, not only with himself, but with those who have to "live with the apparatus." If the latter do not own the building, they can move out, and get away from their troubles, but the man who has designed such an apparatus will have his troubles with him for at least two or three years, and he will always have the sorrow and the regret that he was unfortunate enough to secure that particular piece of work at the outset of his professional career.

Then, too, he had only to deal with a three or four-story building, with masonry walls, wooden floors, and perhaps a roof truss of some magnitude, but scarcely anything within the building that could at all be considered as an engineering problem. This is changed, and it has changed so rapidly in the great American cities that it is bewildering.

The steam and ventlating engineer takes his place with the civil, the mechanical, and the electrical engineers in the construction of great buildings.

The work of the architect to-day is general. He creates the idea and he gives the general design for a building. His duties are executive. The client turns the problem over to the architect and the latter assumes the entire responsibility for the work. Some of his obligations are moral and cannot be covered by specifications. Others are fixed by the rules of ethics, and a few by the decisions of the courts.

The great architect gathers about him a staff of engineers; the civil, the mechanical, the heating and ventilating, the electrical, the sanitary, the refrigerating, the elevator expert, and others; and among these the heating and ventilating engineer takes his place as an expert who is able to render exact services and advice without loss or waste.

His knowledge of architectural construction must be inferior only to the architect's. His first duty is to give the size for chimneys, particularly for power chimneys. He must be able to design and be intimately acquainted with flue construction,

so as not to interfere with the architect's general design, and to advise harmonious changes in the general design, so that the building construction will not be materially interfered with in getting the warming and ventilating flues through the building.

He must, as a mechanical engineer, be thoroughly conversant with types of boilers and their evaporation; with qualities of coal and their relative efficiency; with condensation in all kinds of radiators; with the chemistry of combustion; and with the chemistry of vitiation of air; with hygrometry; with cooling and the laws of cooling; as well as with heating.

The great heating houses often have such men as their engineers, and they are capable of giving a good lay-out to the architect when he cannot employ the services of an expert.

Everyone, however, who puts the sign over his door "Heating and Ventilating" is not always capable of giving such a lay-out, and it is not fair to an owner to accept such a plan, even if there is competition in the bidding.

Commercial interests should prompt the owner to be willing to pay for the services of an expert when the compensation to the architect is not sufficient to cover expert services; and this applies not only to the heating and ventilating engineer, but also to the sanitary engineer and the electrical engineer, and such other engineers who furnish special service under the architect.

There are only a few architectural offices in the country doing sufficient business to be able to retain on their staffs men of sufficient ability to act as disinterested experts and advisers.

The man of ability either becomes a contractor or is paid a large salary by a heating house that is doing sufficient business to warrant such an outlay; and while there are many capable of coping with the problems of simple heating apparatus, there are few who should be entrusted with the design of large ventilating plants on great buildings.

There are not enough to go around to furnish each heating establishment with an engineer competent in the mechanical details of successful ventilating apparatus. It is true the technical schools teach ventilation, and there the foundation for the expert is laid. He usually, however, has to serve another apprenticeship, either correcting his own first failures or working under some one for a considerable time who has gotten beyond the general failure stage and who has sufficient work in his office to permit of the post-student laying out and superintending work of a high standard.

The heating and ventilating engineer must not only be capable of telling the client what is necessary, but he must be capable of giving results that will carry out his recommendations.

More attention should be given to details of construction in

the technical schools so far as ventilation and warming is concerned and all that goes with it, than is now given; and this assertion is not made with any reflection upon the schools and colleges that have a ventilating course. They simply cannot give it, and there is probably only one technical institution in the United States that has an engineer at the head of its ventilating department who has had experience in this respect and who is able to impart it.

It is easier to learn to operate a flying machine through the air than it is to get the air through the flues of a building at the temperature and in the quantity laid down in some requirements. In the one case, if the man fails the world sees it and knows it. In the other case, it may be suspected, but it is rarely or never proven.

Before closing, I want, also, to add a word by saying that ventilation costs money (and by ventilation I do not mean the ventilating apparatus). I simply mean the warming and the moving of the air, and that those who demand systematic ventilation should be prepared to pay for its maintenance.

One of the crying shames of the day is the effort of superintendents of buildings, hospitals and public institutions to show in the annual report the saving he has made in the coal heap. The new superintendent wants to show the board of directors that he is running the building cheaper than his predecessors; and to accomplish this result he either shuts down his fans altogether or merely, as a bluff, keeps them turning over at about 30 R. P. M. when they should be running at 300 R. P. M., and this is done in some of the most prominent hospitals and public buildings in the country.

The superintendent of one prominent hospital said to the writer: "If you had put only a little more direct radiation in this hospital we would not have to run the fans at all." It ran through the writer's mind that possibly this man should have cut down on the appropriations for medicine rather than on an appropriation for fresh air.

Tables for Ventilating Ducts

By Chouteau E. Pearce, M.E.

The accompanying tables may be found useful in rapidly estimating the superficial area and the weights of galvanized sheet iron rectangular ducts, such as are usually employed in ventilating work. The tables, six in number, embrace all sizes, varying from 1 in. up to 60 in. square, which are those in most general use; larger sizes may be readily calculated by following the method which the writer has adopted in preparing these tables.

In the central portion of each table are placed the cross sectional dimensions of the ducts in inches, those in the first (or the last) column representing one dimension and the intervening quantities the other dimension, these latter being so arranged that all sizes of ducts having the same circumference appear in the same vertical column and, therefore, have the same superficial area per lineal foot of length.

The inclined line divides the two portions of the table so as to utilize the whole form, and the resulting quantities are read either up or down, according to which side of this line the second dimension of the duct occurs.

For example, referring to Table I, for 8 in. x 10 in. duct, find 8 in. first (or last) column and pass along horizontally to 10, then read up and find 3 sq. ft. per lin. ft., if superficial area is desired, or continue upward in same column to pounds per lineal foot desired, corresponding to gauge of metal, between No. 16 and No. 26.

If, however, the size of duct is, say 8 in. x 18 in., the latter dimension will be found on the other side of the inclined line, and the resulting quantities are obtained by reading downward in the column in which 18 appears, in the same manner as before.

The quantities given under caption "square feet per lineal foot" are for actual outside surface and are useful when calculating painting, non-conducting coverings and the like. The quantities given under "weight per lineal foot," however, have allowances made for seams and are all based on the assumption that ducts are cut from 30-in. wide sheets and that one lap of 1-in. is required for each sheet so used. In other words, ducts up to 29 in. circumference allow one lapping inch; from 30 in. to 59 in., two lapping inches, and so on up to 60 in. x 60 in., which having 240 in. circumference, 9 lapping inches being allowed in the table of weights.

No attempt has been made to provide for waste material, bracing or hanging and some percentage should be added to the tabulated quantities to take care of these. For ordinary purposes, 10% to 15% will be found sufficient, but, obviously, no exact rule can be laid down, on account of the varying conditions of practice, so that this must be left to the judgment of the estimator.

The Rate of Change of Air in a Closed Room

From time to time experiments have been made to determine the porosity of walls and the leakage of air around windows and doors as affecting the ventilation. Recent experiments conducted by Arthur D. Little, chemical expert and engineer, Boston, have incidentally shown in an interesting manner the rate of change of air in a closed room. This room, having a contents of 615 cu. ft., was located in the second story of an ordinary frame dwelling house with clapboarded exterior walls. The interior walls and ceilings were plastered and papered, the single window was made as tight as possible by means of putty, and the interior door was fitted with weather strips. Notwithstanding these conditions, which one might assume would very materially limit the rate of ventilation, it was found that through perfectly natural causes the air was changing at the rate of 1-8/10 times per hour. This fact was shown accurately by measurement of the rate of disappearance of carbonic acid.

Wt. p. ☐	Gauge	WEIGHT OF GALVANIZED IRON RECTANGULAR DUCTS PER LINEAL FOOT																					Gauge	Wt. p. ☐
27 #	#16		1.13	1.58	2.03	2.48	2.93	3.38	3.83	4.28	4.73	5.18	5.63	6.08	6.53	7.20	7.65	8.10	8.55	9.00	9.45	9.90	#16	27 #
22 #	#18		.92	1.28	1.65	2.02	2.38	2.75	3.12	3.48	3.85	4.22	4.58	4.95	5.32	5.87	6.23	6.60	6.97	7.33	7.70	8.07	#18	22 #
1.7 #	#20		.71	.99	1.28	1.56	1.84	2.13	2.41	2.69	2.98	3.26	3.54	3.83	4.11	4.53	4.82	5.10	5.38	5.67	5.95	6.23	#20	1.7 #
1.5 #	#22		.63	.88	1.13	1.38	1.63	1.88	2.13	2.38	2.63	2.88	3.13	3.38	3.63	4.00	4.25	4.50	4.75	5.00	5.25	5.50	#22	1.5 #
1.2 #	#24		.50	.70	.90	1.10	1.30	1.50	1.70	1.90	2.10	2.30	2.50	2.70	2.90	3.20	3.40	3.60	3.80	4.00	4.20	4.40	#24	1.2 #
1.0 #	#26		.42	.58	.75	.92	1.08	1.25	1.42	1.58	1.75	1.92	2.08	2.25	2.42	2.67	2.83	3.00	3.17	3.33	3.50	3.67	#26	1.0 #
☐ Per Lin. Ft.			.33	.50	.67	.83	1.00	1.17	1.33	1.50	1.67	1.83	2.00	2.17	2.33	2.50	2.67	2.83	3.00	3.17	3.33	3.50	☐ Per Lin. Ft.	

		CROSS SECTIONAL DIMENSIONS OF DUCTS IN INCHES																						
1		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	1		
2		20	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	2		
3		19	20	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	3		
4		18	19	20	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	4		
5		17	18	19	20	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	5		
6		16	17	18	19	20	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	6		
7		15	16	17	18	19	20	1	2	3	4	5	6	7	8	9	10	11	12	13	14	7		
8		14	15	16	17	18	19	20	1	2	3	4	5	6	7	8	9	10	11	12	13	8		
9		13	14	15	16	17	18	19	20	1	2	3	4	5	6	7	8	9	10	11	12	9		
10		12	13	14	15	16	17	18	19	20	1	2	3	4	5	6	7	8	9	10	11	10		
11		11	12	13	14	15	16	17	18	19	20	1	2	3	4	5	6	7	8	9	10	11		
12		10	11	12	13	14	15	16	17	18	19	20	1	2	3	4	5	6	7	8	9	12		
13		9	10	11	12	13	14	15	16	17	18	19	20	1	2	3	4	5	6	7	8	13		
14		8	9	10	11	12	13	14	15	16	17	18	19	20	1	2	3	4	5	6	7	14		
15		7	8	9	10	11	12	13	14	15	16	17	18	19	20	1	2	3	4	5	6	15		
16		6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	1	2	3	4	5	16		
17		5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	1	2	3	4	17		
18		4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	1	2	3	18		
19		3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	1	2	19		
20		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	1	20		
☐ Per Lin. Ft.		3.67	3.83	4.00	4.17	4.33	4.50	4.67	4.83	5.00	5.17	5.33	5.50	5.67	5.83	6.00	6.17	6.33	6.50	6.67			☐ Per Lin. Ft.	
1.0 #	#26	3.83	4.00	4.17	4.33	4.50	4.67	4.83	5.00	5.25	5.42	5.58	5.75	5.92	6.08	6.25	6.42	6.58	6.75	6.92			#26	1.0 #
1.2 #	#24	4.60	4.80	5.00	5.20	5.40	5.60	5.80	6.00	6.30	6.50	6.70	6.90	7.10	7.30	7.50	7.70	7.90	8.10	8.30			#24	1.2 #
1.5 #	#22	5.75	6.00	6.25	6.50	6.75	7.00	7.25	7.50	7.88	8.13	8.38	8.63	8.88	9.13	9.38	9.63	9.88	10.13	10.38			#22	1.5 #
1.7 #	#20	6.52	6.80	7.08	7.37	7.65	7.93	8.21	8.50	8.93	9.21	9.49	9.78	10.06	10.34	10.63	10.91	11.19	11.48	11.76			#20	1.7 #
2.2 #	#18	8.43	8.80	9.17	9.53	9.90	10.27	10.63	11.00	11.55	11.92	12.28	12.65	13.02	13.38	13.75	14.12	14.48	14.85	15.22			#18	2.2 #
2.7 #	#16	10.36	10.80	11.25	11.70	12.15	12.60	13.05	13.50	14.18	14.63	15.08	15.53	15.98	16.43	16.88	17.33	17.78	18.23	18.68			#16	2.7 #
Wt. p. ☐	Gauge	WEIGHT OF GALVANIZED IRON RECTANGULAR DUCTS PER LINEAL FOOT																					Gauge	Wt. p. ☐

TABLE 1—VENTILATING DUCTS

TABLE 2—VENTILATING DUCTS

Wt. p. ☐	Gauge	WEIGHT OF GALVANIZED IRON RECTANGULAR DUCTS PER LINEAL FOOT																					Gauge	Wt. p. ☐
2.7#	#16		10.35	10.80	11.25	11.70	12.15	12.60	13.05	13.50	14.18	14.63	15.08	15.53	15.98	16.43	16.88	17.33	17.78	18.23	18.68	19.13	#16	2.7#
2.2#	#18		8.43	8.80	9.17	9.53	9.90	10.27	10.63	11.00	11.55	11.92	12.28	12.65	13.02	13.38	13.75	14.12	14.48	14.85	15.22	15.58	#18	2.2#
1.7#	#20		6.52	6.80	7.08	7.37	7.65	7.93	8.22	8.50	8.93	9.21	9.49	9.78	10.06	10.34	10.63	10.91	11.19	11.48	11.76	12.04	#20	1.7#
1.5#	#22		5.75	6.00	6.25	6.50	6.75	7.00	7.25	7.50	7.88	8.13	8.38	8.63	8.88	9.13	9.38	9.63	9.88	10.13	10.38	10.63	#22	1.5#
1.2#	#24		4.60	4.80	5.00	5.20	5.40	5.60	5.80	6.00	6.30	6.50	6.70	6.90	7.10	7.30	7.50	7.70	7.90	8.10	8.30	8.50	#24	1.2#
1.0#	#26		3.83	4.00	4.17	4.33	4.50	4.67	4.83	5.00	5.25	5.42	5.58	5.75	5.92	6.08	6.25	6.42	6.58	6.75	6.92	7.08	#26	1.0#
☐ Per Lin. Ft.			3.67	3.83	4.00	4.17	4.33	4.50	4.67	4.83	5.00	5.17	5.33	5.50	5.67	5.83	6.00	6.17	6.33	6.50	6.67	6.83	☐ Per Lin Ft.	
Cross Sectional Dimensions of Ducts in Inches	1		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	1	Cross Sectional Dimensions of Ducts in Inches
	2	40		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	2	
	3	39	40		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	3	
	4	38	39	40		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	4	
	5	37	38	39	40		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	5	
	6	36	37	38	39	40		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	6	
	7	35	36	37	38	39	40		21	22	23	24	25	26	27	28	29	30	31	32	33	34	7	
	8	34	35	36	37	38	39	40		21	22	23	24	25	26	27	28	29	30	31	32	33	8	
	9	33	34	35	36	37	38	39	40		21	22	23	24	25	26	27	28	29	30	31	32	9	
	10	32	33	34	35	36	37	38	39	40		21	22	23	24	25	26	27	28	29	30	31	10	
	11	31	32	33	34	35	36	37	38	39	40		21	22	23	24	25	26	27	28	29	30	11	
	12	30	31	32	33	34	35	36	37	38	39	40		21	22	23	24	25	26	27	28	29	12	
	13	29	30	31	32	33	34	35	36	37	38	39	40		21	22	23	24	25	26	27	28	13	
	14	28	29	30	31	32	33	34	35	36	37	38	39	40		21	22	23	24	25	26	27	14	
	15	27	28	29	30	31	32	33	34	35	36	37	38	39	40		21	22	23	24	25	26	15	
	16	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40		21	22	23	24	25	16	
	17	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40		21	22	23	24	17	
	18	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40		21	22	23	18	
	19	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40		21	22	19	
	20	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40		21	20	
☐ Per Lin. Ft.		7.00	7.17	7.33	7.50	7.67	7.83	8.00	8.17	8.33	8.50	8.67	8.83	9.00	9.17	9.33	9.50	9.67	9.83	10.00			☐ Per Lin. Ft.	
1.0#	#26	7.25	7.42	7.58	7.83	8.00	8.17	8.33	8.50	8.67	8.83	9.00	9.17	9.33	9.50	9.67	9.83	10.00	10.17	10.42			#26	1.0#
1.2#	#24	8.70	8.90	9.10	9.40	9.60	9.80	10.00	10.20	10.40	10.60	10.80	11.00	11.20	11.40	11.60	11.80	12.00	12.20	12.50			#24	1.2#
1.5#	#22	10.88	11.13	11.38	11.75	12.00	12.25	12.50	12.75	13.00	13.25	13.50	13.75	14.00	14.25	14.50	14.75	15.00	15.25	15.63			#22	1.5#
1.7#	#20	12.33	12.61	12.89	13.32	13.60	13.88	14.17	14.45	14.73	15.02	15.30	15.58	15.87	16.15	16.43	16.72	17.00	17.28	17.71			#20	1.7#
2.2#	#18	15.95	16.32	16.68	17.23	17.60	17.97	18.33	18.70	19.07	19.43	19.80	20.17	20.53	20.90	21.27	21.63	22.00	22.37	22.92			#18	2.2#
2.7#	#16	19.58	20.03	20.48	21.15	21.60	22.05	22.50	22.95	23.40	23.85	24.30	24.75	25.20	25.65	26.10	26.55	27.00	27.45	28.13			#17	27#
Wt. p. ☐	Gauge	WEIGHT OF GALVANIZED IRON RECTANGULAR DUCTS PER LINEAL FOOT																					Gauge	Wt. p. ☐

TABLE 3—VENTILATING DUCTS

Wt. p. ☐	Gauge	WEIGHT OF GALVANIZED IRON RECTANGULAR DUCTS PER LINEAL FOOT																				Gauge	Wt. p. ☐
2.7#	#16		19.58	20.03	20.48	21.15	21.60	22.05	22.50	22.95	23.40	23.85	24.30	24.75	25.20	25.65	26.10	26.55	27.00	27.45	28.13	28.58	#16	2.7#
2.2#	#18		15.95	16.32	16.68	17.23	17.60	17.97	18.33	18.70	19.07	19.43	19.80	20.17	20.53	20.90	21.27	21.63	22.00	22.37	22.92	23.28	#18	2.2#
1.7#	#20		12.33	12.61	12.89	13.32	13.60	13.88	14.17	14.45	14.73	15.02	15.30	15.58	15.87	16.15	16.43	16.72	17.00	17.28	17.71	17.99	#20	1.7#
1.5#	#22		10.88	11.13	11.38	11.75	12.00	12.25	12.50	12.75	13.00	13.25	13.50	13.75	14.00	14.25	14.50	14.75	15.00	15.26	15.63	15.88	#22	1.5#
1.2#	#24		8.70	8.90	9.10	9.40	9.60	9.80	10.00	10.20	10.40	10.60	10.80	11.00	11.20	11.40	11.60	11.80	12.00	12.20	12.50	12.70	#24	1.2#
1.0#	#26		7.25	7.42	7.58	7.83	8.00	8.17	8.33	8.50	8.67	8.83	9.00	9.17	9.33	9.50	9.67	9.83	10.00	10.17	10.42	10.58	#26	1.0#
☐ Per Lin. Ft.			7.00	7.17	7.33	7.50	7.67	7.83	8.00	8.17	8.33	8.50	8.67	8.83	9.00	9.17	9.33	9.50	9.67	9.83	10.00	10.17	☐ Per Lin. Ft.	
Cross Sectional Dimensions of Ducts in Inches	1		41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	1	Cross Sectional Dimensions of Ducts in Inches
	2	60		41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	2	
	3	59	60		41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	3	
	4	58	59	60		41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	4	
	5	57	58	59	60		41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	5	
	6	56	57	58	59	60		41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	6	
	7	55	56	57	58	59	60		41	42	43	44	45	46	47	48	49	50	51	52	53	54	7	
	8	54	55	56	57	58	59	60		41	42	43	44	45	46	47	48	49	50	51	52	53	8	
	9	53	54	55	56	57	58	59	60		41	42	43	44	45	46	47	48	49	50	51	52	9	
	10	52	53	54	55	56	57	58	59	60		41	42	43	44	45	46	47	48	49	50	51	10	
	11	51	52	53	54	55	56	57	58	59	60		41	42	43	44	45	46	47	48	49	50	11	
	12	50	51	52	53	54	55	56	57	58	59	60		41	42	43	44	45	46	47	48	49	12	
	13	49	50	51	52	53	54	55	56	57	58	59	60		41	42	43	44	45	46	47	48	13	
	14	48	49	50	51	52	53	54	55	56	57	58	59	60		41	42	43	44	45	46	47	14	
	15	47	48	49	50	51	52	53	54	55	56	57	58	59	60		41	42	43	44	45	46	15	
	16	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60		41	42	43	44	45	16	
	17	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60		41	42	43	44	17	
	18	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60		41	42	43	18	
	19	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60		41	42	19	
	20	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60		41	20	
☐ Per Lin. Ft.		10.33	10.50	10.67	10.83	11.00	11.17	11.33	11.50	11.67	11.83	12.00	12.17	12.33	12.50	12.67	12.83	13.00	13.17	13.33			☐ Per Lin. Ft.	
1.0#	#26	10.75	10.92	11.08	11.25	11.42	11.58	11.75	11.92	12.08	12.25	12.42	12.58	12.75	13.00	13.17	13.33	13.50	13.67	13.83			#26	1.0#
1.2#	#24	12.90	13.10	13.30	13.50	13.70	13.90	14.10	14.30	14.50	14.70	14.90	15.10	15.30	15.60	15.80	16.00	16.20	16.40	16.60			#24	1.2#
1.5#	#22	16.13	16.38	16.63	16.88	17.13	17.38	17.63	17.88	18.13	18.38	18.63	18.88	19.13	19.50	19.75	20.00	20.25	20.50	20.75			#22	1.5#
1.7#	#20	18.28	18.56	18.84	19.13	19.41	19.69	19.98	20.26	20.54	20.83	21.11	21.39	21.68	22.10	22.38	22.67	22.95	23.23	23.52			#20	1.7#
2.2#	#18	23.65	24.02	24.38	24.75	25.12	25.48	25.85	26.22	26.58	26.95	27.32	27.68	28.05	28.60	28.97	29.33	29.70	30.07	30.43			#18	2.2#
2.7#	#16	29.03	29.48	29.93	30.38	30.83	31.28	31.73	32.18	32.63	33.08	33.53	33.98	34.43	35.10	35.55	36.00	36.45	36.90	37.35			#16	2.7#
Wt. p. ☐	Gauge	WEIGHT OF GALVANIZED IRON RECTANGULAR DUCTS PER LINEAL FOOT																				Gauge	Wt. p. ☐

TABLE 4—VENTILATING DUCTS

Wt. p. ☐	Gauge	WEIGHT OF GALVANIZED IRON RECTANGULAR DUCTS PER LINEAL FOOT																					Gauge	Wt. p. ☐
2.7#	#16		19.58	20.03	20.48	21.15	21.60	22.05	22.50	22.95	23.40	23.85	24.30	24.75	25.20	25.65	26.10	26.55	27.00	27.45	28.13	28.58	#16	2.7#
2.2#	#18		15.95	16.32	16.68	17.23	17.60	17.97	18.33	18.70	19.07	19.43	19.80	20.17	20.53	20.90	21.27	21.63	22.00	22.37	22.92	23.28	#18	2.2#
1.7#	#20		12.33	12.61	12.89	13.32	13.60	13.88	14.17	14.45	14.73	15.02	15.30	15.58	15.87	16.15	16.43	16.72	17.00	17.28	17.71	17.99	#20	1.7#
1.5#	#22		10.88	11.13	11.38	11.75	12.00	12.25	12.50	12.75	13.00	13.25	13.50	13.75	14.00	14.25	14.50	14.75	15.00	15.25	15.63	15.88	#22	1.5#
1.2#	#24		8.70	8.90	9.10	9.40	9.60	9.80	10.00	10.20	10.40	10.60	10.80	11.00	11.20	11.40	11.60	11.80	12.00	12.20	12.50	12.70	#24	1.2#
1.0#	#26		7.25	7.42	7.58	7.83	8.00	8.17	8.33	8.50	8.67	8.83	9.00	9.17	9.33	9.50	9.67	9.83	10.00	10.17	10.42	10.58	#26	1.0#
☐ Per Lin. Ft.			7.00	7.17	7.33	7.50	7.67	7.83	8.00	8.17	8.33	8.50	8.67	8.83	9.00	9.17	9.33	9.50	9.67	9.83	10.00	10.17	☐ Per Lin. Ft.	
Cross Sectional Dimensions of Ducts in Inches	21		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	21	Cross Sectional Dimensions of Ducts in Inches
	22	40		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	22	
	23	39	40		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	23	
	24	38	39	40		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	24	
	25	37	38	39	40		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	25	
	26	36	37	38	39	40		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	26	
	27	35	36	37	38	39	40		21	22	23	24	25	26	27	28	29	30	31	32	33	34	27	
	28	34	35	36	37	38	39	40		21	22	23	24	25	26	27	28	29	30	31	32	33	28	
	29	33	34	35	36	37	38	39	40		21	22	23	24	25	26	27	28	29	30	31	32	29	
	30	32	33	34	35	36	37	38	39	40		21	22	23	24	25	26	27	28	29	30	31	30	
	31	31	32	33	34	35	36	37	38	39	40		21	22	23	24	25	26	27	28	29	30	31	
	32	30	31	32	33	34	35	36	37	38	39	40		21	22	23	24	25	26	27	28	29	32	
	33	29	30	31	32	33	34	35	36	37	38	39	40		21	22	23	24	25	26	27	28	33	
	34	28	29	30	31	32	33	34	35	36	37	38	39	40		21	22	23	24	25	26	27	34	
	35	27	28	29	30	31	32	33	34	35	36	37	38	39	40		21	22	23	24	25	26	35	
	36	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40		21	22	23	24	25	36	
	37	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40		21	22	23	24	37	
	38	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40		21	22	23	38	
	39	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40		21	22	39	
	40	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40		21	40	
☐ Per Lin. Ft.		10.33	10.50	10.67	10.83	11.00	11.17	11.33	11.50	11.67	11.83	12.00	12.17	12.33	12.50	12.67	12.83	13.00	13.17	13.33			☐ Per Lin. Ft.	
1.0#	#26	10.75	10.92	11.08	11.25	11.42	11.58	11.75	11.92	12.08	12.25	12.42	12.58	12.75	13.00	13.17	13.33	13.50	13.67	13.83			#26	1.0#
1.2#	#24	12.90	13.10	13.30	13.50	13.70	13.90	14.10	14.30	14.50	14.70	14.90	15.10	15.30	15.60	15.80	16.00	16.20	16.40	16.60			#24	1.2#
1.5#	#22	16.13	16.38	16.63	16.88	17.13	17.38	17.63	17.88	18.13	18.38	18.63	18.88	19.13	19.50	19.75	20.00	20.25	20.50	20.75			#22	1.5#
1.7#	#20	18.28	18.56	18.84	19.13	19.41	19.69	19.98	20.26	20.54	20.83	21.11	21.39	21.68	22.10	22.38	22.67	22.95	23.23	23.52			#20	1.7#
2.2#	#18	23.65	24.02	24.38	24.75	25.12	25.48	25.85	26.22	26.58	26.95	27.32	27.68	28.05	28.60	28.97	29.33	29.70	30.07	30.43			#18	2.2#
2.7#	#16	29.03	29.48	29.93	30.38	30.83	31.28	31.73	32.18	32.63	33.08	33.53	33.98	34.43	35.10	35.55	36.00	36.45	36.90	37.35			#16	2.7#
Wt. p. ☐	Gauge	WEIGHT OF GALVANIZED IRON RECTANGULAR DUCTS PER LINEAL FOOT																					Gauge	Wt. p. ☐

Wt. p. ft	Gauge	WEIGHT OF GALVANIZED IRON RECTANGULAR DUCTS PER LINEAL FOOT																				Gauge	Wt. p. ft
2.7#	#16		29.03	29.48	29.93	30.38	30.83	31.28	31.73	32.18	32.63	33.08	33.53	33.98	34.43	35.10	35.55	36.00	36.90	37.35	37.80	#16	2.7#
2.2#	#18		23.65	24.02	24.38	24.75	25.12	25.48	25.85	26.22	26.58	26.95	27.32	27.68	28.05	28.60	28.77	29.23	29.70	30.07	30.43	#18	2.2#
1.7#	#20		18.28	18.56	18.84	19.13	19.41	19.69	19.98	20.26	20.54	20.83	21.11	21.39	21.68	22.10	22.38	22.67	22.95	23.23	23.52	#20	1.7#
1.5#	#22		16.13	16.38	16.63	16.88	17.13	17.38	17.63	17.89	18.13	18.38	18.63	18.88	19.13	19.50	19.75	20.00	20.25	20.50	20.75	#22	1.5#
1.2#	#24		12.90	13.10	13.30	13.50	13.70	13.90	14.10	14.30	14.50	14.70	14.90	15.10	15.30	15.60	15.80	16.00	16.20	16.40	16.60	#24	1.2#
1.0#	#26		10.75	10.92	11.08	11.25	11.42	11.58	11.75	11.92	12.08	12.25	12.42	12.58	12.75	13.00	13.17	13.33	13.50	13.67	13.83	#26	1.0#
℄ PER LIN. FT.			10.33	10.50	10.67	10.83	11.00	11.17	11.33	11.50	11.67	11.83	12.00	12.17	12.33	12.50	12.67	12.83	13.00	13.17	13.33	13.50	℄ PER LIN. FT.

CROSS SECTIONAL DIMENSIONS OF DUCTS IN INCHES

21	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	21		
22	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	22		
23	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	23		
24	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	24		
25	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	25		
26	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	26		
27	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	27		
28	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	28		
29	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	29		
30	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	30		
31	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	31		
32	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	32		
33	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	33		
34	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	34		
35	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	35		
36	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	36		
37	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	37		
38	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	38		
39	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	39		
40	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	40		
℄ PER LIN. FT.	13.67	13.83	14.00	14.17	14.33	14.50	14.67	14.83	15.00	15.17	15.33	15.50	15.67	15.83	16.00	16.17	16.33	16.50	16.67				℄ PER LIN. FT.
10#	#26	14.17	14.33	14.50	14.67	14.83	15.00	15.17	15.33	15.50	15.67	15.83	16.00	16.17	16.33	16.50	16.67	16.83	17.00	17.17		#26	10#
1.2#	#24	17.00	17.20	17.40	17.60	17.80	18.00	18.20	18.40	18.70	18.90	19.10	19.30	19.50	19.70	19.90	20.10	20.30	20.50	20.70		#24	1.2#
1.5#	#22	21.25	21.50	21.75	22.00	22.25	22.50	22.75	23.00	23.38	23.63	23.88	24.13	24.38	24.63	24.88	25.13	25.38	25.63	25.88		#22	1.5#
1.7#	#20	24.08	24.37	24.65	24.93	25.22	25.50	25.78	26.07	26.49	26.78	27.06	27.34	27.63	27.91	28.19	28.45	28.76	29.04	29.33		#20	1.7#
2.2#	#18	31.17	31.53	31.90	32.27	32.63	33.00	33.37	33.73	34.28	34.65	35.02	35.38	35.75	36.12	36.48	36.85	37.22	37.58	37.95		#18	2.2#
2.7#	#16	38.25	38.70	39.15	39.60	40.05	40.50	40.95	41.40	42.08	42.53	42.98	43.43	43.88	44.33	44.78	45.23	45.68	46.13	46.58		#16	2.7#
Wt. p. ft	Gauge	WEIGHT OF GALVANIZED IRON RECTANGULAR DUCTS PER LINEAL FOOT																				Gauge	Wt. p. ft

CROSS SECTIONAL DIMENSIONS OF DUCTS IN INCHES

TABLE 5—VENTILATING DUCTS

TABLE 6—VENTILATING DUCTS

Wt. p. Φ	Gauge	WEIGHT OF GALVANIZED IRON RECTANGULAR DUCTS PER LINEAL FOOT																					Gauge	Wt. p. Φ
2.7#	#16		38.25	38.70	39.15	39.60	40.05	40.50	40.95	41.40	42.08	42.53	42.98	43.43	43.88	44.33	44.78	45.23	45.68	46.13	46.58	47.03	#16	2.7#
2.2#	#18		31.17	31.53	31.90	32.27	32.63	33.00	33.37	33.73	34.28	34.65	35.02	35.38	35.75	36.12	36.48	36.85	37.22	37.58	37.95	38.32	#18	2.2#
1.7#	#20		24.08	24.37	24.66	24.93	25.22	25.50	25.78	26.07	26.49	26.78	27.06	27.34	27.63	27.91	28.19	28.48	28.76	29.04	29.33	29.61	#20	1.7#
1.5#	#22		21.25	21.50	21.75	22.00	22.25	22.50	22.75	23.00	23.38	23.63	23.88	24.13	24.38	24.63	24.88	25.13	25.38	25.63	25.88	26.13	#22	1.5#
1.2#	#24		17.00	17.20	17.40	17.60	17.80	18.00	18.20	18.40	18.70	18.90	19.10	19.30	19.60	19.70	1990	20.10	20.30	20.50	20.70	20.90	#24	1.2#
1.0#	#26		14.17	14.33	14.50	14.67	14.83	15.00	15.17	15.33	15.58	15.75	15.92	16.08	16.25	16.42	16.58	16.75	16.92	17.08	17.25	17.42	#26	1.0#
ΦPer Lin. Ft.			13.67	13.83	14.00	14.17	14.33	14.50	14.67	14.83	15.00	15.17	15.33	15.50	15.67	15.83	16.00	16.17	16.33	16.50	16.67	16.83	ΦPer Lin. Ft.	
CROSS SECTIONAL DIMENSIONS OF DUCTS IN INCHES	41		41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	41	CROSS SECTIONAL DIMENSIONS OF DUCTS IN INCHES
	42	60		41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	42	
	43	59	60		41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	43	
	44	58	59	60		41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	44	
	45	57	58	59	60		41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	45	
	46	56	57	58	59	60		41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	46	
	47	55	56	57	58	59	60		41	42	43	44	45	46	47	48	49	50	51	52	53	54	47	
	48	54	55	56	57	58	59	60		41	42	43	44	45	46	47	48	49	50	51	52	53	48	
	49	53	54	55	56	57	58	59	60		41	42	43	44	45	46	47	48	49	50	51	52	49	
	50	52	53	54	55	56	57	58	59	60		41	42	43	44	45	46	47	48	49	50	51	50	
	51	51	52	53	54	55	56	57	58	59	60		41	42	43	44	45	46	47	48	49	50	51	
	52	50	51	52	53	54	55	56	57	58	59	60		41	42	43	44	45	46	47	48	47	52	
	53	49	50	51	52	53	54	55	56	57	58	59	60		41	42	43	44	45	46	47	48	53	
	54	48	49	50	51	52	53	54	55	56	57	58	59	60		41	42	43	44	45	46	47	54	
	55	47	48	49	50	51	52	53	54	55	56	57	58	59	60		41	42	43	44	45	46	55	
	56	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60		41	42	43	44	45	56	
	57	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60		41	42	43	44	57	
	58	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60		41	42	43	58	
	59	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60		41	42	59	
	60	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60		41	60	
ΦPer Lin. Ft.		17.00	17.17	17.33	17.50	17.67	17.83	18.00	18.17	18.33	18.50	18.67	18.83	19.00	19.17	19.33	19.50	19.67	19.83	20.00			ΦPer Lin. Ft.	
1.0#	#26	17.58	17.75	17.92	18.17	18.33	18.50	18.67	18.83	19.00	19.17	19.33	19.50	19.67	19.83	20.00	20.17	20.33	20.50	20.75			#26	1.6#
1.2#	#24	21.10	21.30	21.50	21.80	22.00	22.20	22.40	22.60	22.80	23.00	23.20	23.40	23.60	23.80	24.00	24.20	24.40	24.60	24.90			#24	1.2#
1.5#	#22	26.38	26.63	26.88	27.25	27.50	27.75	28.00	28.25	28.50	28.75	29.00	29.25	29.50	29.75	30.00	30.25	30.50	30.75	31.13			#22	1.5#
1.7#	#20	29.89	30.18	30.46	30.88	31.17	31.45	31.73	32.02	32.30	32.58	32.87	33.15	33.43	33.72	34.00	34.28	34.57	34.85	35.28			#20	1.7#
2.2#	#18	38.68	39.05	39.42	39.97	40.33	40.70	41.07	41.43	41.80	42.17	42.53	42.90	43.27	43.63	44.00	44.37	44.73	45.10	45.65			#18	2.2#
2.7#	#16	47.48	47.93	48.38	49.06	49.50	49.95	50.40	50.85	51.30	51.75	52.20	52.65	53.10	53.55	54.00	54.45	54.90	55.35	56.03			#16	2.7#
Wt. p. Φ	Gauge	WEIGHT OF GALVANIZED IRON RECTANGULAR DUCTS PER LINEAL FOOT																					Gauge	Wt. p. Φ

Ventilating Scheme for a Hotel Building

Application of Rectangular and Round Air Ducts in Secor Hotel, Toledo, Ohio

The Secor Hotel is located at Jefferson and Superior streets, Toledo, having a frontage of 121 ft. on Jefferson avenue and a depth of 168 ft. along Superior street, with the basement extending 16 ft. under each sidewalk. The hotel has ten floors devoted to the use of the public, besides basement and attic.

With the exception of the first floor and basement, direct steam heat is used throughout the building. Indirect heat is used for heating the first floor and basement. Outside air is admitted through a rectangular intake located at the back of the hotel, back of the barroom, and opens out on the skylight directly over this room.

During cold weather the incoming air is warmed by eight banks of 40-in. Vento indirect radiators containing about 115 sq. ft. of heating surface,

SECOR HOTEL, TOLEDO

arranged two banks deep, one-half being automatically controlled by thermostats, the other by hand control.

After passing the tempering coils the air passes through two type A McCreery air washers, capable of handling 60,000 cu. ft. of air per minute. The air next passes into the main suction chamber. That intended for the main engine room and kitchen is taken by an 80-in. fan direct.

The air that is delivered to the public rooms on the first floor passes through two banks of three sections, each of indirect heating coils, containing 4,270 lineal feet of 1-in. pipe. One-half of these coils are controlled by thermostats, the other half by hand. Fan No. 2 supplies the south half, No. 3 the north half of the building, and fan No. 4 supplies the engine room and kitchen. The size of these fans are shown on the drawing.

In the ducts leading to the rooms on the first floor are Vento stack reheaters controlled by thermostats located in the rooms. All reheaters and tempering coils are provided with by-pass dampers to take care of the increased volume of air in summer. Data regarding the reheaters will be found in the following table:

Reheaters	Lead	Capacity in sq. ft.	Sections	Size inches
A	To bar room	3,000	5	40
B	To cafe	3,000	5	40
C	To dining room	3,600	5	40
D	To front lobby	2,250	4	40
E	To lobby	2,250	4	40
F	To side of lobby	4,500	7	40
G	To billiard room	3,000	5	40

PROVISION FOR SUMMER AND WINTER VENTILATION

In the dining room and café the air is supplied through special grills located along two sides of the room directly under the windows, each being in two parts and arranged with dampers, so that during warm weather the air is delivered from the side outlet directly across the room, while in cold weather the warm air is delivered directly upwards in front of the window, preventing frost on the glass and the cold drafts which enter owing to window leakage.

The barroom is ventilated by means of a duct overhead hidden by the grape vines and provided with openings, which deliver the air downwards. Mc-

Creery adjustable louvres are provided along the side walls and deliver cooled air in summer, taking the place of oscillating fans for producing a breeze. These louvres are capable of delivering air in any direction, and by adjusting the louvres themselves, the quantity of air delivered can be regulated.

Air is exhausted from this room by means of a large duct located directly

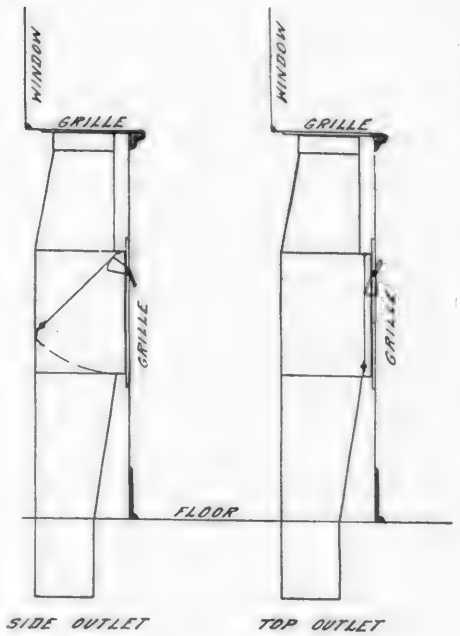
TYPES OF ADJUSTABLE DAMPERS USED IN VENTILATING DUCTS OF SECOR HOTEL

over the bar in the ceiling. Exhaust ventilation is also provided for the dining room and café on the opposite walls from the supply. During the summer, air is admitted to the billiard room through grills located near the floor on two sides of the room, with additional grills near the ceiling for use in cold weather. Air is exhausted from one end of the room by means of two large grills located about 10 ft. above the floor line.

Fresh air is admitted to the lobby by means of grills located at the floor line under the cigar counter and under the desk. A large grill is also located under the balcony. Two large grills are located about 10 ft. above the floor near the entrance, and four grills about 10 or 12 ft. above the floor on the wall back of the desk. The grills located high up are intended for use in cold weather, whereas those located near the floor are for use in summer.

The entire system for ventilating is designed on the principle that the best results in ventilation can be obtained by admitting cold freshened air at or near the floor line in summer, the natural tendency of heated air being to rise. In winter the air is uncomfortably warm when admitted through the grills so close to the floor, so that all heated air is admitted well above the breathing line.

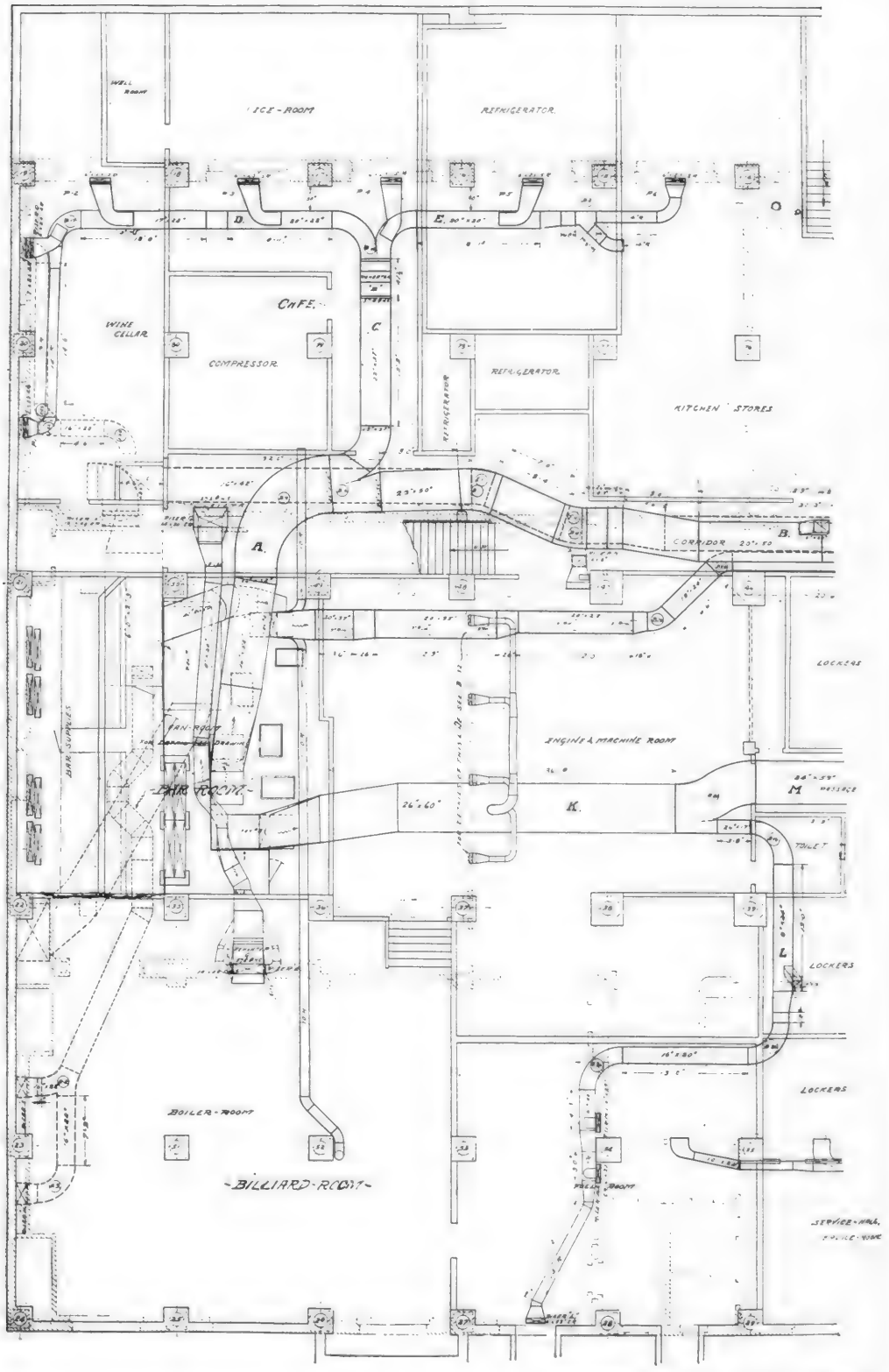
The matter of providing insulation for the floors of the public rooms received special attention. The main floor slabs are 6-in. concrete, with tile. A suspended ceiling was put in 4 in. below the main slab and dropped below the beams. Cooled air is admitted along one side of each of this suspended ceiling and outlets provided along the opposite side, so that there is a continuous flow of cooled air under the ceiling of all rooms in which the temperature is liable to become excessive, such as the engine and boiler rooms and kitchen.



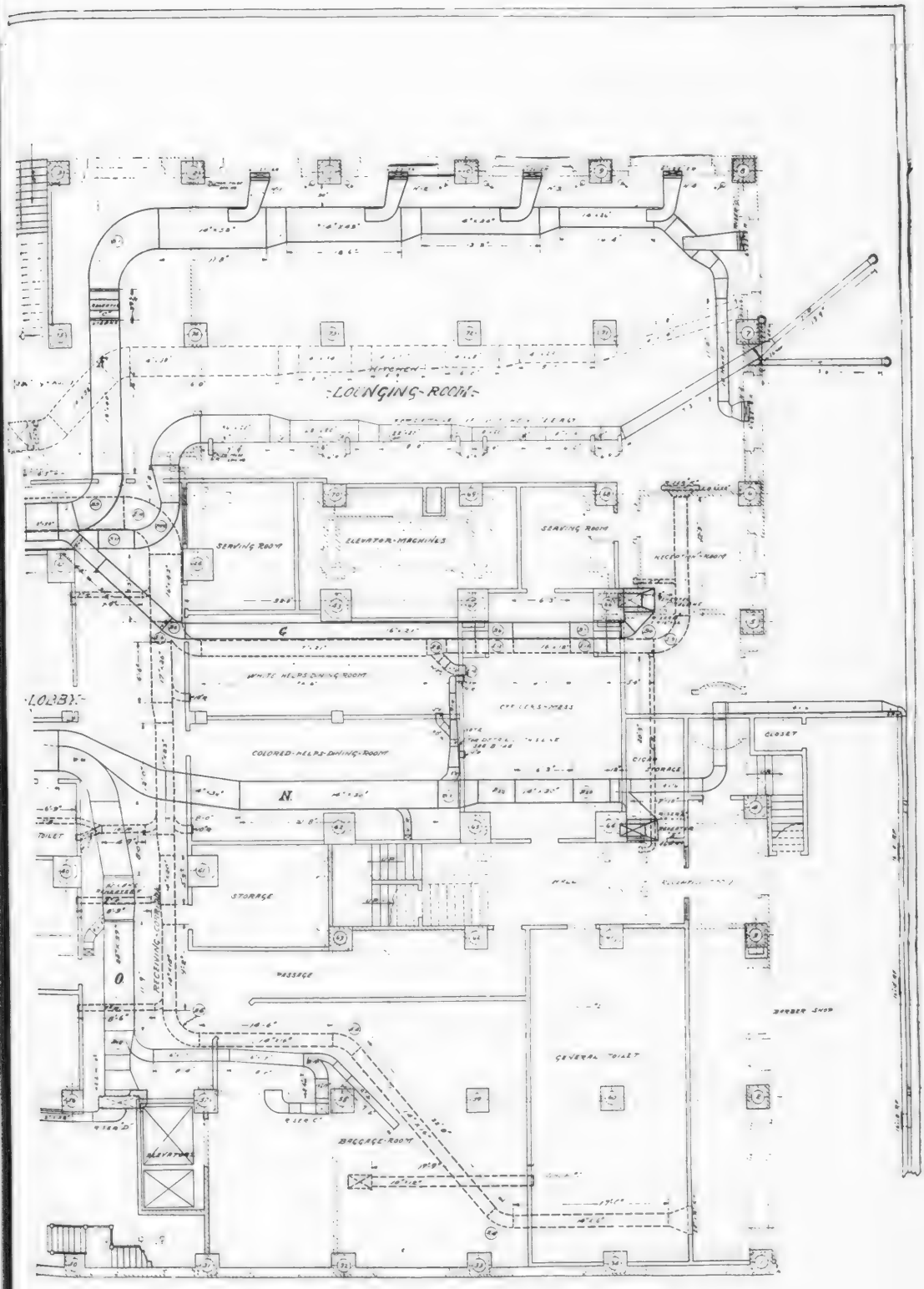
WINDOW OUTLETS FOR DINING ROOM AND CAFE OF SECOR HOTEL, TOLEDO

KITCHEN VENTILATING EQUIPMENT

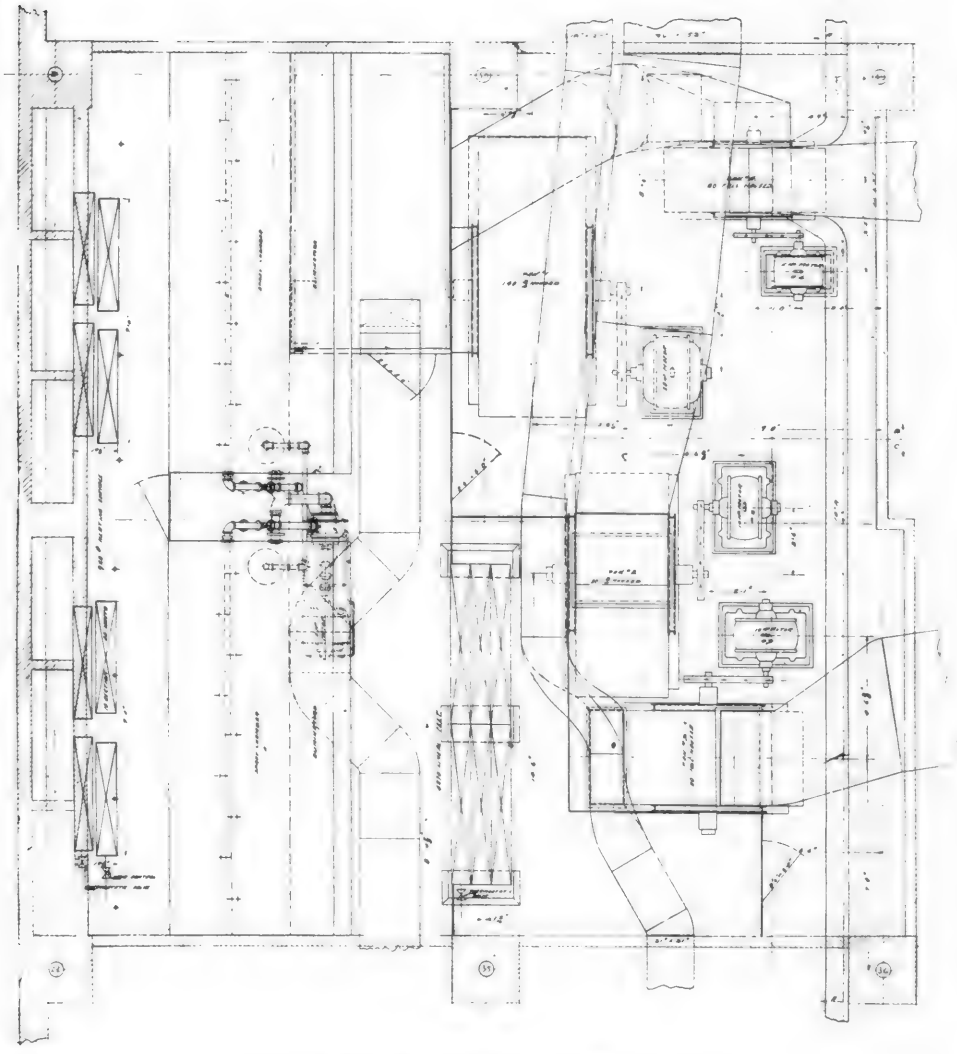
The kitchen is ventilated by means of a supply pipe located under the ceiling in line with the front of the ranges. Seven-inch adjustable elbows are provided, opening directly downward, to supply fresh cooled air to the cooks. These elbows are capable of being adjusted so as to deliver the air in any direction desired. Branches from this



BASEMENT PLAN OF SECOR HOTEL,



TOLEDO, OHIO, SHOWING PIPE LAYOUT

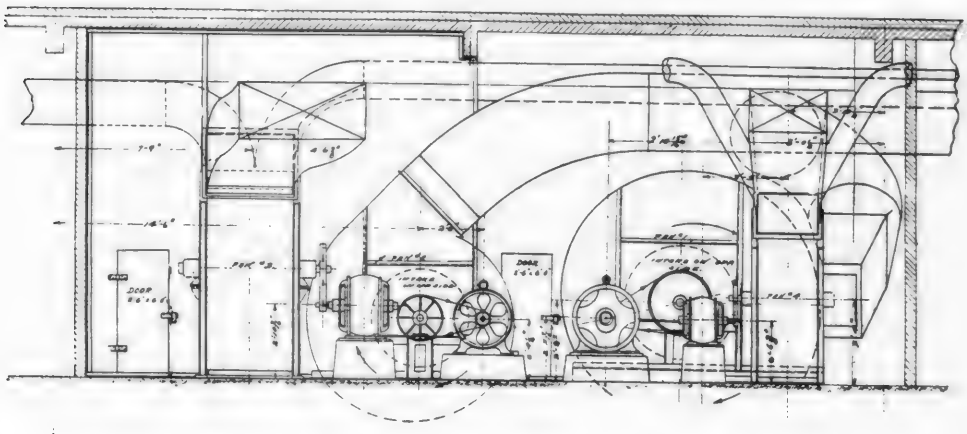


PLAN OF FAN ROOM, SECOR HOTEL, TOLEDO

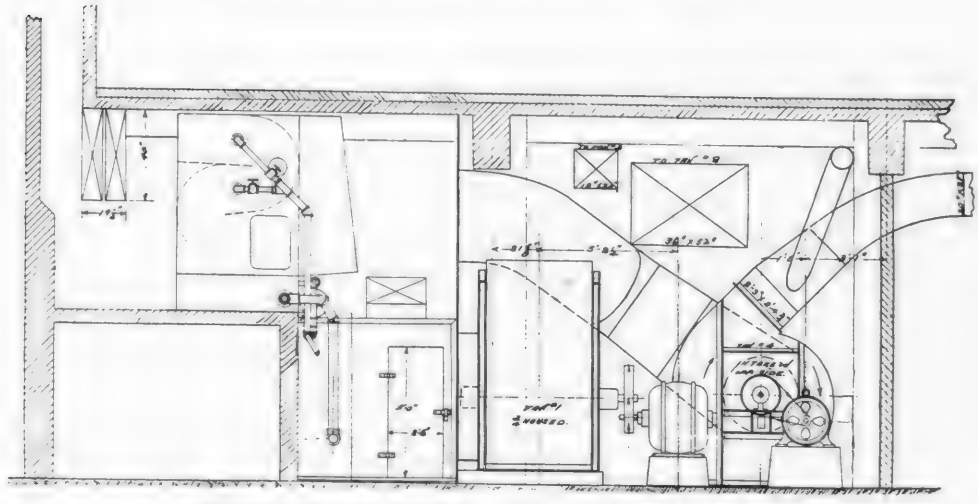
cold air line enter the false ceiling, with pipes directed in the sidewalk. An exhaust line is run the full length of the kitchen, provided with grills for removing the heated air from the ceiling. This pipe enters the exhaust shaft and extends up same a distance of 10 or 12 ft. A damper is provided in this exhaust shaft so that the quantity of air exhausted through this pipe can be varied. The main shaft being open at the bottom, the exhaust pipe just mentioned takes care of only a portion of the total quantity of the air exhausted from the kitchen. All openings into the kitchen from the basement are kept closed, so that the air which is exhausted is drawn from the dining rooms, café and serving room on the first floor down the stairway and then into the air shaft.

This prevents all odors and heat rising from the kitchen to the main floor. A 60-in. cone fan, direct connected to a 15-H.P. 40-frame, Fort Wayne motor, is located on the roof to exhaust the air from the shaft. The speed of this fan is from 175 to 350 R. P. M.

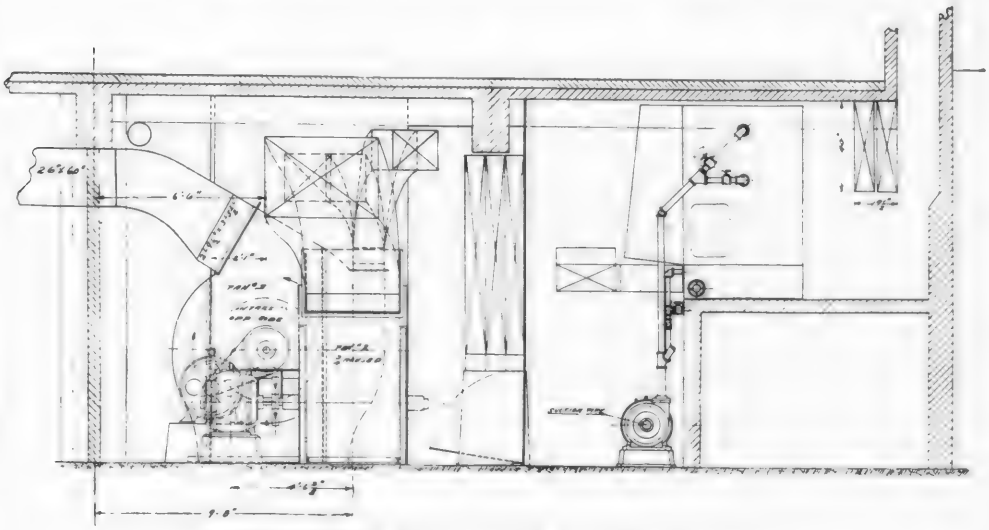
Owing to the building being monolithic concrete, it was impossible to obtain noiseless operation of the fan and motor, so that the entire apparatus was placed upon a spring foundation, as shown in the accompanying drawing.



SECTION OF FAN ROOM, SECOR HOTEL, ON LINE A-A



SECTION OF FAN ROOM, SECOR HOTEL, ON LINE B-B



SECTION OF FAN ROOM, SECOR HOTEL, ON LINE C-C

THE AIR WASHERS

The air washers installed are each capable of handling 30,000 cu. ft. of air per minute. An interesting point in connection with them is the fact that the disagreeable odors coming from the numerous cheap restaurants near the hotel is entirely eliminated by the air washer.

The water for the washers is supplied by a 3-in. Dayton pump, supplying 350 gals. of water per minute against 45-ft. head, operated by a 15-H.P. electric motor. All motors excepting the one operating the cone fan on the roof and centrifugal, are connected to their respective fans by means of Morse silent chain drives.

The architect of the building is George S. Mills, Toledo, and the heating and ventilating system was designed and installed by the McCreery Engineering Co., Toledo.

An Indirect System for Heating and Ventilating Railroad Coaches

Details of the ventilating features of the new Pennsylvania Railroad passenger coaches, including illustrations of the apparatus as installed, have been received from Mr. Ivy D. Lee, of the company's general office in Philadelphia. The description of the apparatus is taken from a recent report of a committee to the Master Car Builders' Association.

The system admits the air through hoods located on diagonal corners of the car. The air passes down a vertical boxing to a horizontal duct under the floor, which duct runs the length of the car between the side and the adjacent intermediate sills. Then the air ascends through slots in the floor to a longitudinal boxing or duct containing steam pipes, extending along the sides of the car, above the floor and immediately over the air duct, thence through galvanized iron tubular pipes under each seat to the aisle, where it ascends and passes out through globe ventilators located over the lamps along the center line of the upper deck.

The system is designed to furnish 1,000 cu. ft. of fresh air per hour per person, while working normally on a moving train. This figure was based on there being 60 passengers to the car, which would require 60,000 cu. ft. of air per car per hour, a complete change of air in the car fifteen times per hour, or once every four minutes. That this amount of air is furnished by the ventilating arrangement, has been proven by numerous tests which were made during its development.

Samples of air were taken under various conditions from cars filled

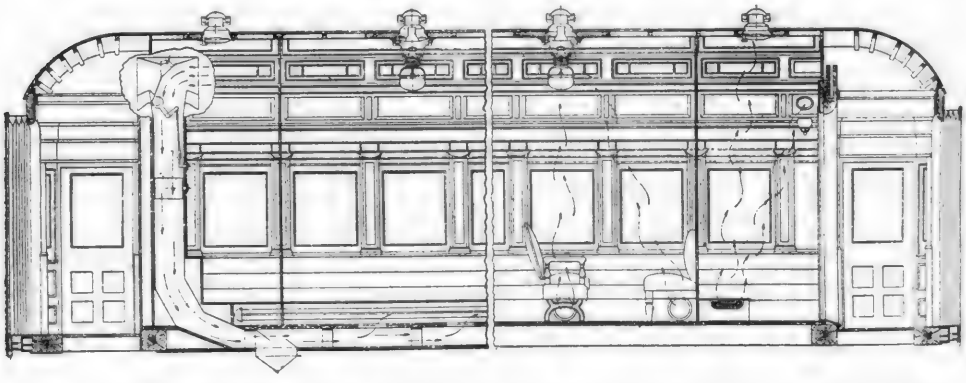


FIG. 1—LONGITUDINAL CROSS SECTION OF NEW PENNSYLVANIA RAILROAD COACH, SHOWING OPERATION OF INDIRECT SYSTEM

with workmen, while the train was running at speed with all the ventilators open; also, while the train was running with all the ventilators closed, as well as while it was standing still with all the ventilators open.

The analyses were made by a test for carbonic acid in the air, and the calculations were made by determining the amount of fresh air that it would take to dilute the estimated amount of carbonic acid exhaled by the number of men in the car, so that the air in the car would equal in carbonic acid the amount that was actually found to exist in the samples taken.

TEST SHOW SUCCESS OF SYSTEM.

A representative test made in the winter time under normal conditions, showed by this method of calculation that 62,400 cu. ft. of air per car per hour was furnished, while the train was running about 30 miles per hour with all the ventilators open; 27,000 to 37,000 cu. ft. of air was furnished while running with all the ventilators closed, and about 23,000 cu. ft. while the train was standing with the ventilators open.

The general arrangement and the important details of the Pennsylvania ventilating system are shown by Figs. 1, 2 and 3. There are no patented features used, and a description of the essential parts of the system is as follows:

The intake hoods, vertical and horizontal air ducts, and the heating ducts and pipes, form two independent systems, one extending along each side of the car. The intake hoods are located at the diagonal corners of the car on the roof close to the upper deck where they will catch the least amount of dust and cinders, and their openings are covered with fine wire gauze.

These hoods contain a flap valve, so arranged that the air has a free passage into the downtake from the direction toward which the car is moving. This flap valve is operated from the inside of the car and must be set for the proper direction by the trainmen. There is a butterfly valve located in the downtake, which is used to exclude foul air and smoke whenever necessary, as, for instance, when going through tunnels. The air passage or duct between the floor and sills of the car is formed by the removal of the cross-bracing in the wooden cars, and by the substitution of iron braces in the form of a trough section. These braces are bolted to the sills and act as efficiently as do the usual wooden ones.

This duct contains a hopper for collecting the dirt and cinder, though occasionally it is necessary

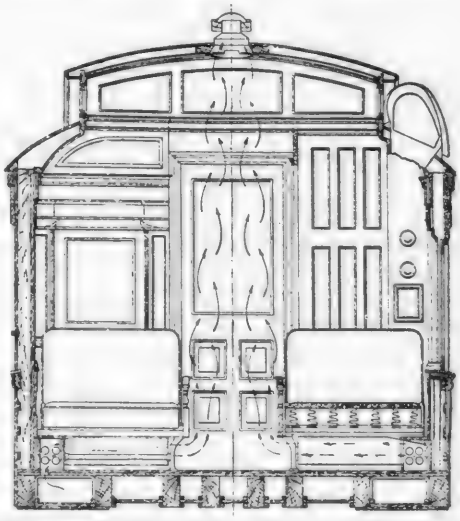


FIG. 2—TRANSVERSE CROSS SECTION OF COACH

to remove portions of the false bottom for this purpose.

The heating duct, located immediately over the air duct, contains two or more radiator pipes extending the length of the car. The heating surface is sufficient to give one sq. ft. for each 300 cu. ft. of air per hour, when the system is operating normally with 60,000 cu. ft. of air passing through the car per hour. Steam is received at the middle of the car, flows to the ends, and the condensation is returned to the middle where it is trapped to the track.

COURSE OF AIR THROUGH CAR

The heating duct is connected

with the air duct by slots through the floor 2 in. wide and 12 in. long. There is one of these slots between each two seats. The air passes through these slots into the heat duct, and thence through galvanized iron pipes 8 in. in diameter leading to the aisle under each seat.

There are seven globe ventilators

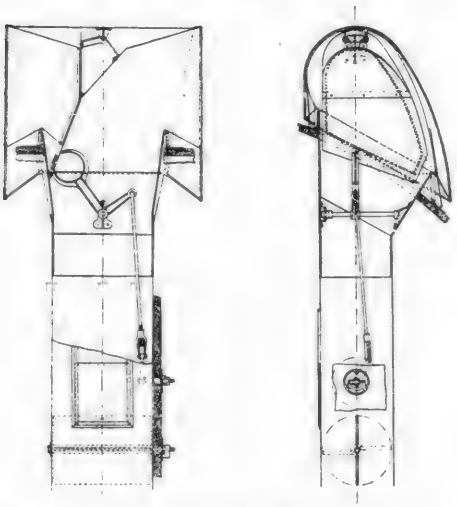


FIG. 3—DETAILS OF VENTILATING HOODS FOR NEW PENNSYLVANIA RAILROAD COACHES

arranged along the center line of the upper deck, five of them over the lamps and one at each end of the car. The two end ventilators have a register in them, the apertures of which, when open wide, are a little more than equal to the area of the 6-in. ventilator tube.

The closing of these registers shuts off all exit of air through these end ventilators, since there is no smoke bell to provide a constant opening, as is the case with the five combined ventilators over the lamps.

The lamp ventilators have a register arranged around a smoke bell 3 in. in diameter extending upwardly into the ventilator. The registers surrounding the smoke bell are operated the same as are those in the two end ventilators, while the smoke bells provide constant openings through the roof equal to about one-fourth of the area of the ventilators over the lamps. The deck sash in the car are tight and immovable, which feature restricts the exit of air entirely to the ventilators, where the proper proportion of opening is maintained.

UNIFORM TEMPERATURE MAINTAINED

The temperature, and the movement of air in the different parts of the car, is almost uniform in the winter time when the car is closed, and the currents of air are hardly active enough to be perceptible. Globe ventilators are used on the roof over the saloons at each end of the car, which, in connection with the close balance of pressure maintained in the car body, tend to cause a slight movement of air currents toward the saloons, rather than from them into the body of the car.

The amount of air passing through the car when running at speed is somewhat dependent upon the speed and the direction of the winds, and the apparatus should be regulated accordingly, by the trainmen. The two independent sides of the system depend for their relative efficiency upon the direction of the wind. If the wind is dead ahead, both sides of the system seem to be equally effective, but with the wind ahead and to the right or left, the side from which the wind is coming seems to do the most ventilating. When the train is running with the wind, neither side works quite as efficiently as under the former conditions.

SYSTEM CONTINUES IN OPERATION WHEN CAR STOPS

The operation of the system is not entirely dependent on the movement of the car; since, when the car is standing still, the normal circulation of air is maintained by the rising heated currents, when there is heat or light in the car. This natural rising of the warm currents will furnish, under favorable conditions, about one-third of the change of air necessary for a crowded car. When a car is standing at a terminal and there is neither heat

nor light in it, which is usually in the summer time, the proper ventilation is not furnished through the ventilating system, but is obtained by keeping the windows and doors open as much as possible.

As a whole, the system is efficient in almost every way when the train is running, but when the train is standing still, the system itself does not provide for any better ventilation than is afforded by the ordinary deck sash arrangement.

This can clearly be seen in a smoking car; first, by observing the accumulation of smoke and the stillness of the air when the car is standing at the station awaiting departure with the doors open, and then, after the train starts and the doors are closed, by watching the gradual disappearance of the heavily laden air until the train has attained its speed; at which time the air in the car has become fresh and the car is almost cleared of smoke.

The smoke passes from all parts of the car gradually and without showing the presence of cross-currents or draughts, and fresh air is supplied without attracting the attention of the passengers. The circulation and the distribution of air in the car act in the same general way when the train is standing still as when it is running, except that when standing still the air movement is slight, and depends upon the difference of temperature inside and outside of the car; while in the latter case, the air movement caused by this difference of temperature is augmented by the forcing in of the air at the intake and by the induced draught at the ventilators.

The conditions that prevail while a train is standing still are so quickly relieved after it gets into motion that the insufficient amount of ventilation supplied in the former case is comparatively of minor importance. This means that, in any system of day coach ventilation, we have first to consider the condition in which the passengers are kept enclosed for hours at a time during a long trip, and then, after this is made satisfactory, to take care of the local terminal conditions in whatever way seems advisable and in accordance with the necessity.

This terminal condition is of more vital concern in the case of sleeping cars which may be in such service as require them to stand in a station during the night for a number of hours before the departure or after the arrival of a train. The only way to solve this difficulty will be to install a forced-draught system on a few cars that could be assigned exclusively to such service as was thought to warrant the extra expense. This would involve the installation of fans, ducts and registers arranged according to the type of car.

Heat escapes from a pipe line in two distinct manners, by convection and by radiation. If the air surrounding a pipe is still, very nearly all the heat is lost by radiation, and if it is moving, a large amount of heat is lost by convection. The less convection there is set up about a pipe the less heat is lost by the pipe.

Conductance of different materials varies with the temperature. A substance may be a fairly good insulator at a comparatively low temperature and when heated become a first-class conductor. However, very little is known concerning the conductance of heat at excessively high temperatures.

Conduction is the heating of the molecules, carried on through heated molecules imparting their heat to those contiguous to them. Though specific heats of atoms of all solids are the same, the specific heats of the molecules vary, since the thermal capacities of the latter depend upon the sum of the specific heats of their atoms, since all molecules are not composed of the same number of atoms. It seems that the ratio of the conductance of two different materials ought to be equal to the ratio of the specific heats of their molecules, but this is not the case, because conductance also depends on the construction or "make-up" of the material.—*L. O. Hodge.*

Heating and Ventilating the National City Bank, New York

Among New York's public buildings, one of the most notable is the National City Bank, which stands on the site of the old Merchants' Exchange, on Wall street, and which, previous to its recent reconstruction, was for years one of the landmarks of lower New York as the old United States Custom House. There is little left of the former building by which one might identify it, except the stone work in the basement and first story, and also parts of the basement, where some of the original construction, including pier work and curious brick arches, have been retained.

The mechanical equipment of the building is one of the last installations entrusted to the late Alfred R. Wolff, of New York, and will serve as a typical example of the practice of his office at the time of his death.

The supply fans for the banking room and the office spaces are located on the third floor, directly above the main banking room. This location has proved a very satisfactory one, on account of its proximity to the banking room and office spaces.

Steam and electricity are furnished to the building from outside sources, so that at present there are no boilers installed; but space has been reserved in the basement for a complete boiler and electric generating plant at some future time, so that the disposition of the piping, etc., will permit of this future installation, including engines, dynamos, etc., without any material change in the work now installed.

Courtesy Architects' and Builders' Magazine

BANKING ROOM, NATIONAL CITY BANK

Courtesy of Architects' and Builders' Magazine
NATIONAL CITY BANK BUILDING, NEW YORK, LOOKING FROM WALL AND WILLIAM STREETS

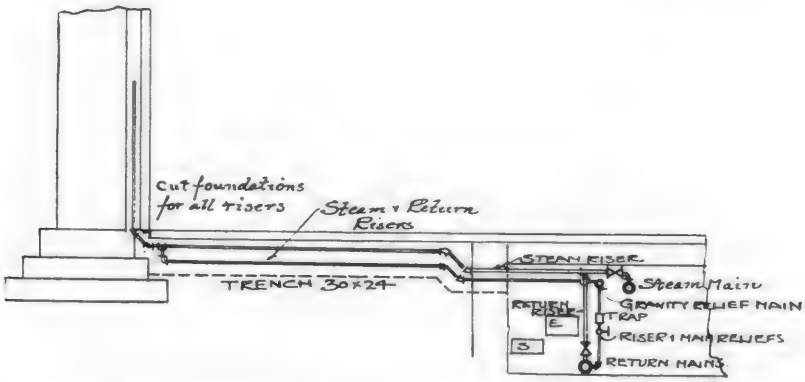
VENTILATING SYSTEM

Tempered fresh air is supplied to the basement, ground floor, the first, second and third mezzanine floors, as well as exhaust ventilation from these floors. There is also exhaust ventilation, as stated, from the dining room, library, etc., and the kitchen department on the roof house floor, as well as from the toilets on the office floors. The space in the basement devoted to the machinery department is provided with air supply and exhaust ventilation.

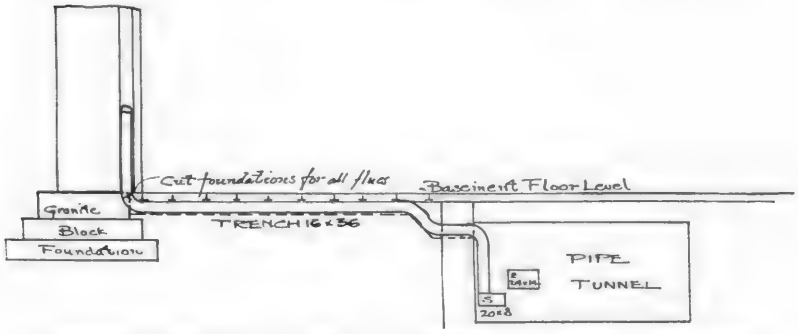
For the above-mentioned purposes eight blowers are provided, as follows:

One Sturtevant fan with a wheel 5 ft. in diameter by 2 ft. 6 in. wide furnishes the fresh-air supply to the offices in the basement.

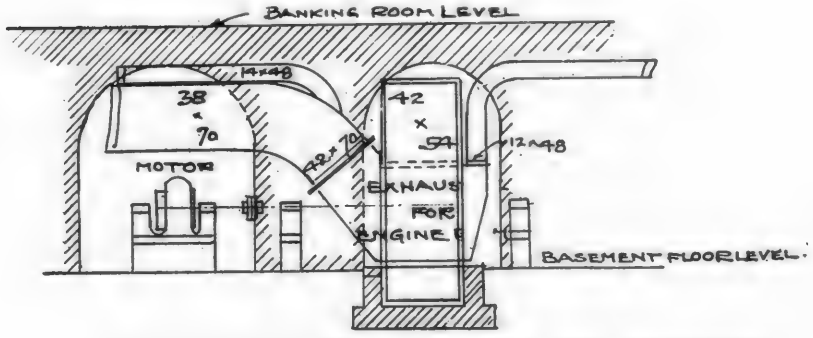
One Sirocco fan, 48 in. outside diameter with a 2 ft. 8⅜ in. wide casing,



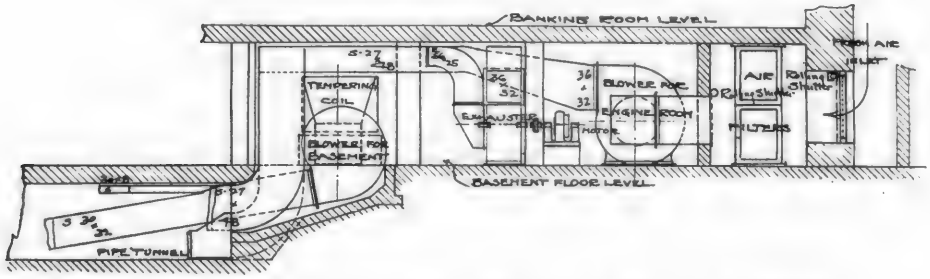
SECTION THROUGH TUNNEL IN BASEMENT, SHOWING TRENCHES AND RISER CONNECTIONS



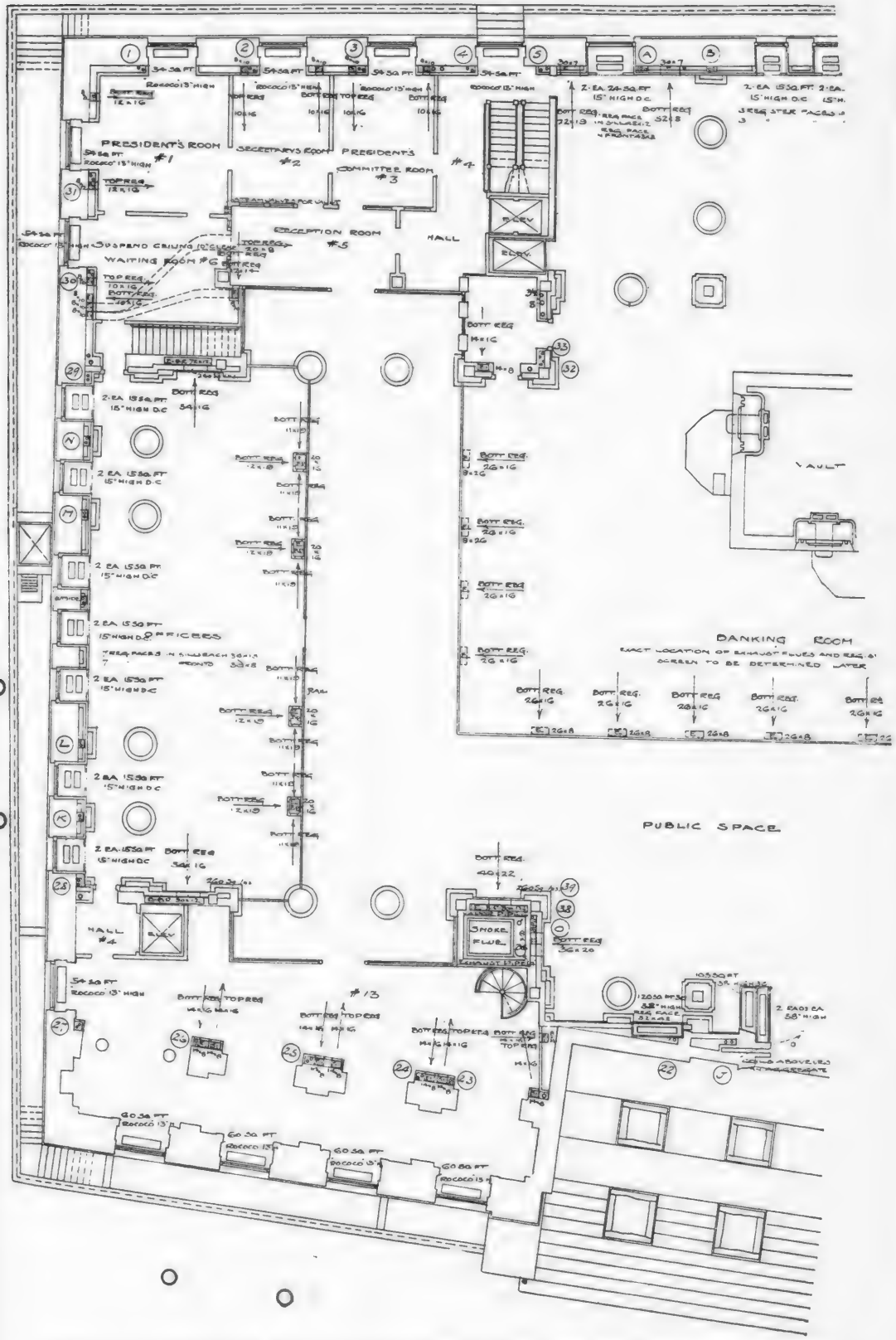
SECTION THROUGH TUNNEL IN BASEMENT, SHOWING TRENCHES AND DUCT CONNECTIONS



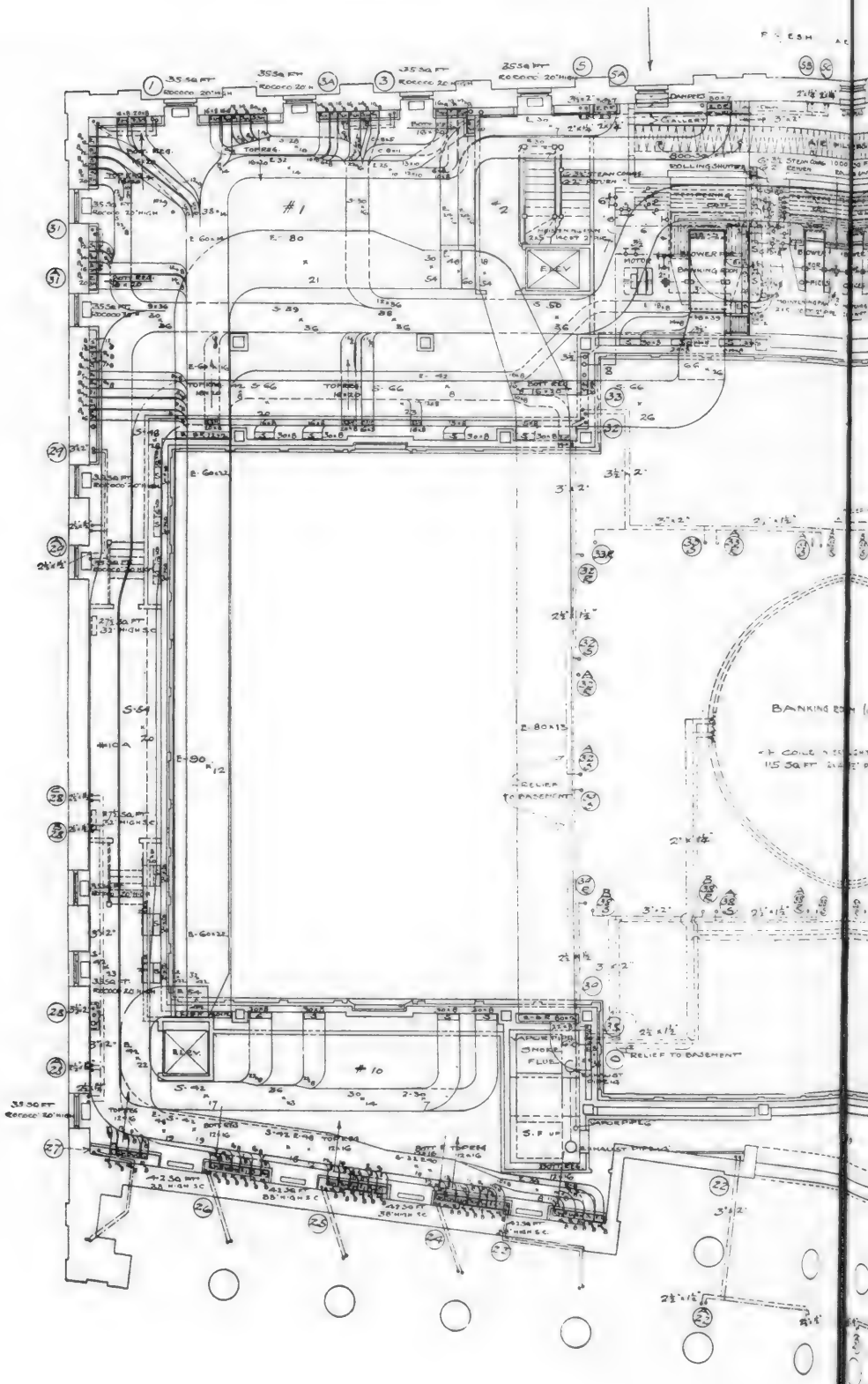
SECTION THROUGH ENGINE ROOM EXHAUSTER, IN BASEMENT



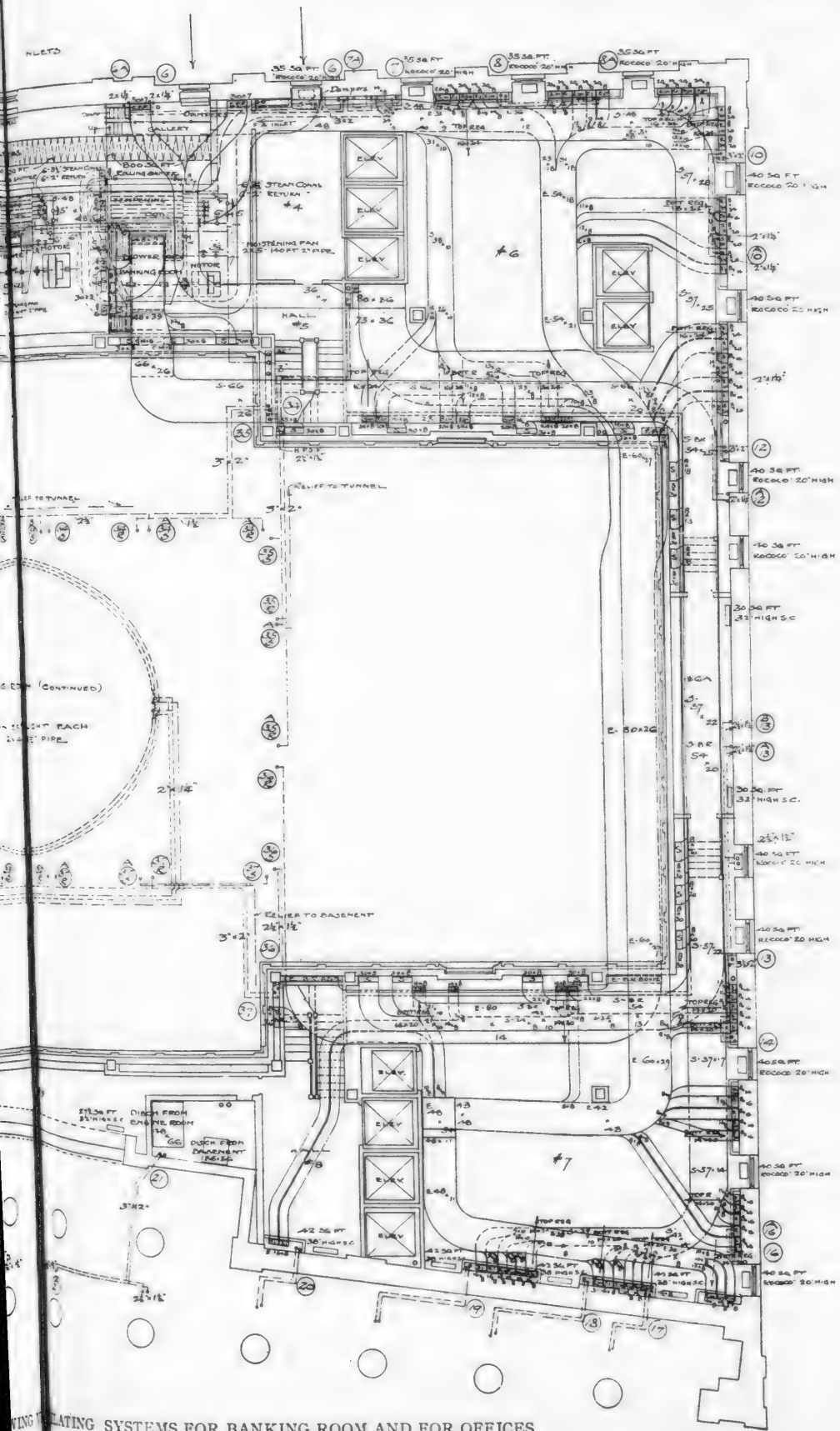
SECTION THROUGH VENTILATING APPARATUS, ETC., IN BASEMENT



PART PLAN OF BANKING ROOM, NATIONAL CITY BANK, SHOWING VENTILATING SCHEME



THIRD MEZZANINE FLOOR PLAN, NATIONAL CITY BANK, SHOWING



ING VENTILATING SYSTEMS FOR BANKING ROOM AND FOR OFFICES

supplies fresh air to the engine room, etc.

Two Sturtevant fans, each with a blast wheel 7 ft. 6 in. in diameter by 4 ft. wide, furnish the fresh-air supply to the banking room.

One Sturtevant fan with a blast wheel 7 ft. wide in a 3-ft. casing supplies fresh air to the offices on the ground, first, second and third mezzanine floors on the Hanover street side, while a similar fan performs the same service on the William street side. These two fans are coupled together on one shaft.

One Sirocco fan, with a blast wheel 66 in. outside diameter and a 3 ft. 8⅜ in. casing, is used for exhausting the air from the engine room, etc.

One Sturtevant fan, with a blast wheel 5 ft. in diameter by 3 ft. 6 in. wide, exhausts the air from the basement.

Five of the fans draw through tempering coils, one in connection with the blower for the basement, two for the banking room, and one each for the offices on the Hanover and William street sides.

The exhaust fan equipment includes six Blackman disk fans, four fans for exhausting the air from the banking room and from the offices on the ground, first, second and third mezzanine floors, as well as from the toilets on office floors. They are each 5 ft. in diameter. The other two disk fans are used for exhausting air from the dining rooms, library, etc., and from the kitchen, etc. These fans are each 3 ft. 6 in. in diameter, and were furnished by Howard & Morse, New York. The exhaust as well as the supply fans are all operated by direct-connected C. & C. electric motors.

On account of the great size of the banking room, the method of heating and ventilating this room is perhaps the most interesting feature of the installation. The room has been described as one of the most magnificent, as well as one of the largest, banking rooms in New York. The ceiling is 58 ft. above the floor, while the top of the glass dome forming a skylight from the central court of the upper portion of the building is 14 ft. higher. The other dimensions of the room are 185 x 120 ft. The banking room contains 1,000,000 cu. ft. of space, and the ventilating equipment is designed to supply 45,000 cu. ft. of air a minute, and exhaust 35,000 cu. ft. of air per minute.

The working spaces at the four corners of the banking room have four floors and represent 600,000 cu. ft. of space.

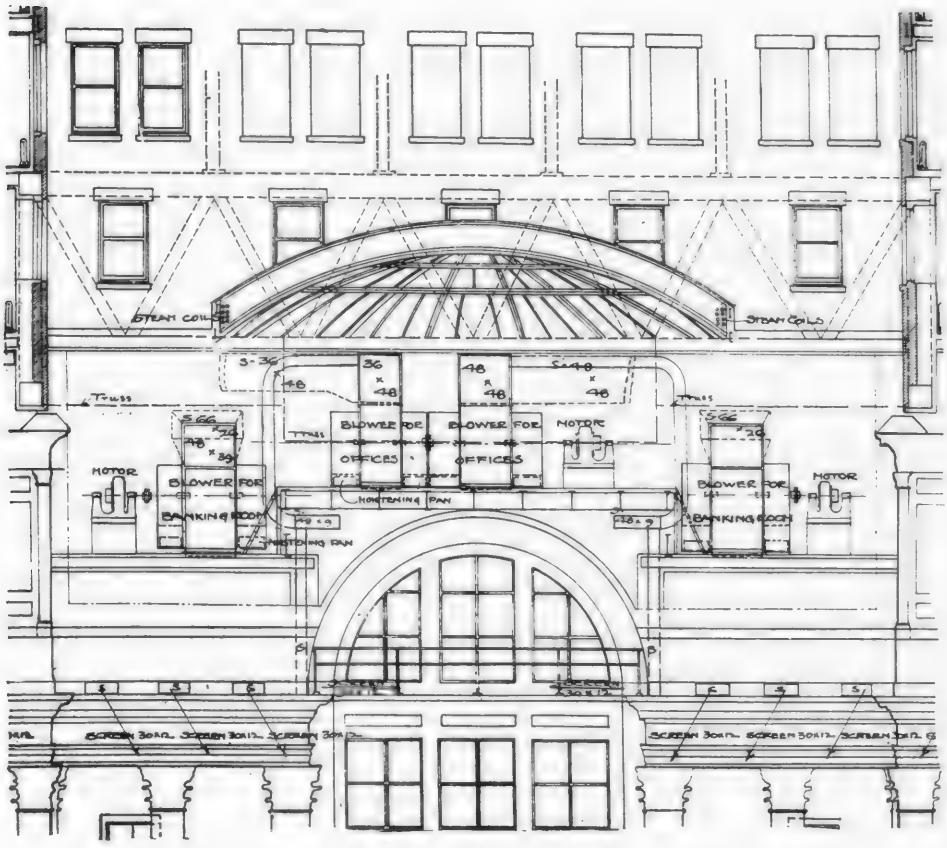
The rooms for clerks, lockers, toilets, etc., in the basement are provided with an independent ventilating apparatus designed to supply 12,000 cu. ft. of air per minute, and exhaust 13,000 cu. ft. of air per minute.

Another interesting feature is the kitchen equipment, which is part of a fully equipped restaurant on the top floor conducted for the convenience of the bank's employees. The dining room will seat 128 persons at a time, and there are two additional small dining rooms for the use of the officers. A system of exhaust ventilation is installed for these rooms, as well as a separate system of exhaust ventilation for the balance of the top floor.

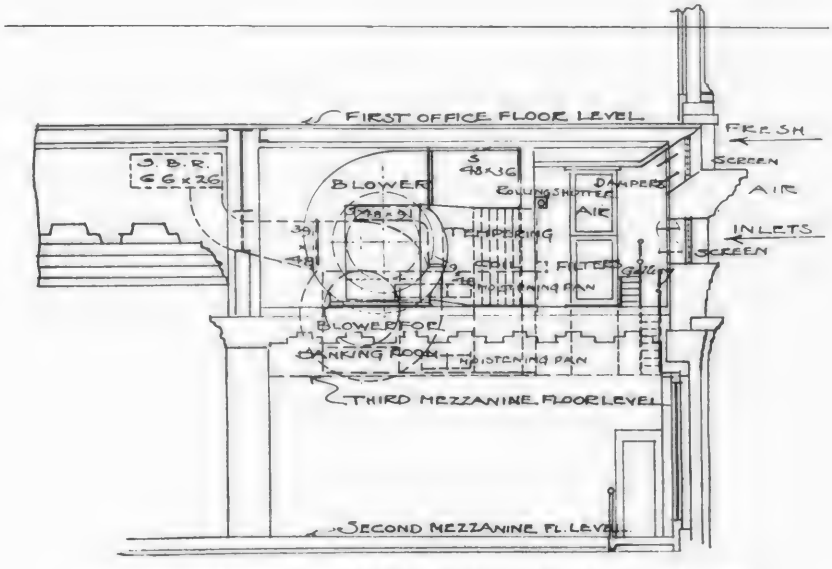
An observation of the accompanying plans will show the principal features of the system, as installed.

Two connections with the street steam mains are made, one 10-in. on the Wall street side and one 8-in. on the William street side. Included in the apparatus supplied by high-pressure steam are the house and fire pumps, air sweeping apparatus, refrigerating plant, air compressors of the elevator service, drip pumps, automatic pumps and receivers, operated by a Utility pump governor, vacuum pumps, air compressors of the heat-regulating system and the reducing valves.

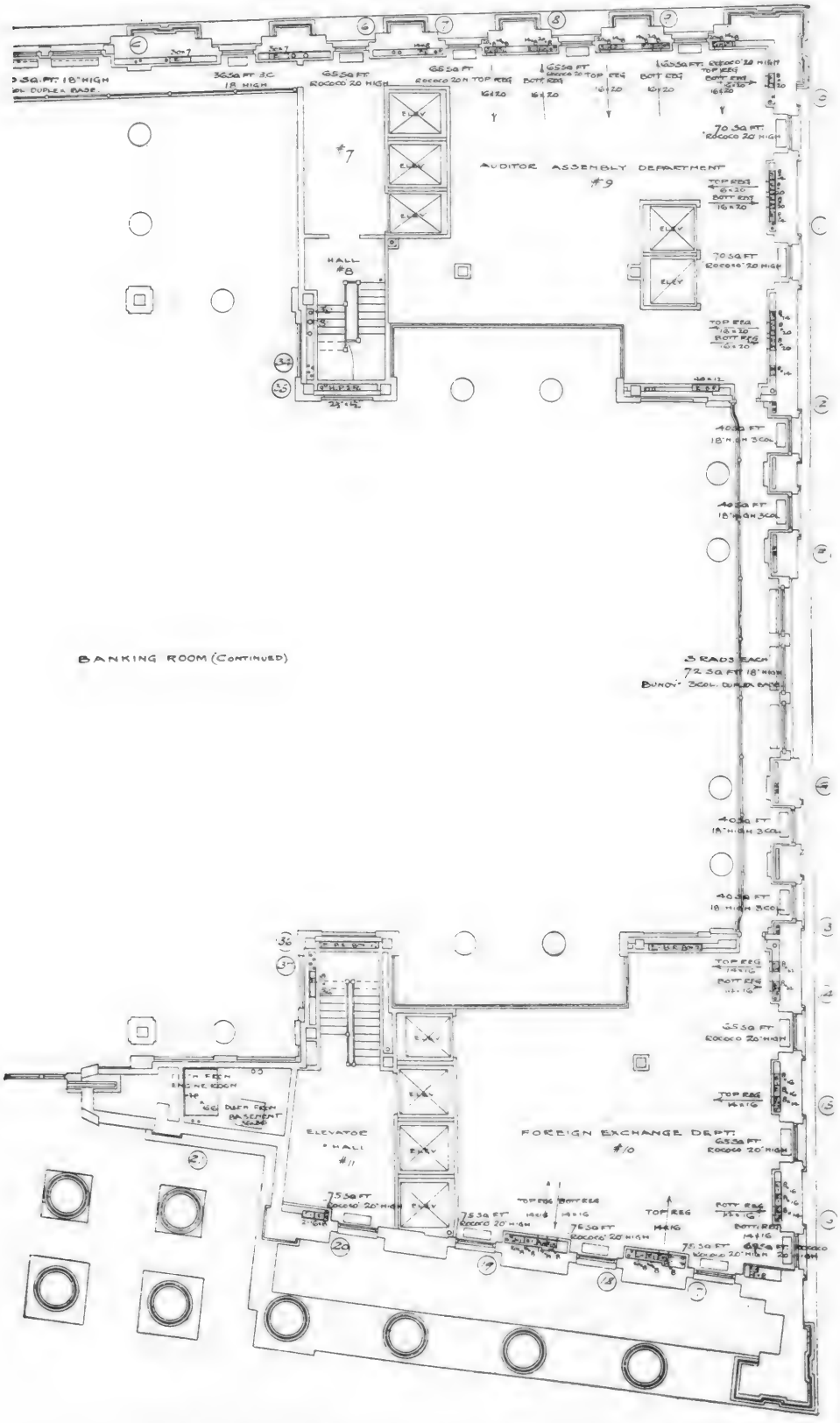
The exhaust steam from this apparatus, after passing through a grease extractor, is connected to the vertical exhaust pipe with a back pressure valve and to the low-pressure heating main, hot-water tanks, etc. The exhaust pipe is 14-in. and the vertical vapor pipe 6-in., the exhaust and vapor pipes being designed to permit the installation of an electric gen-



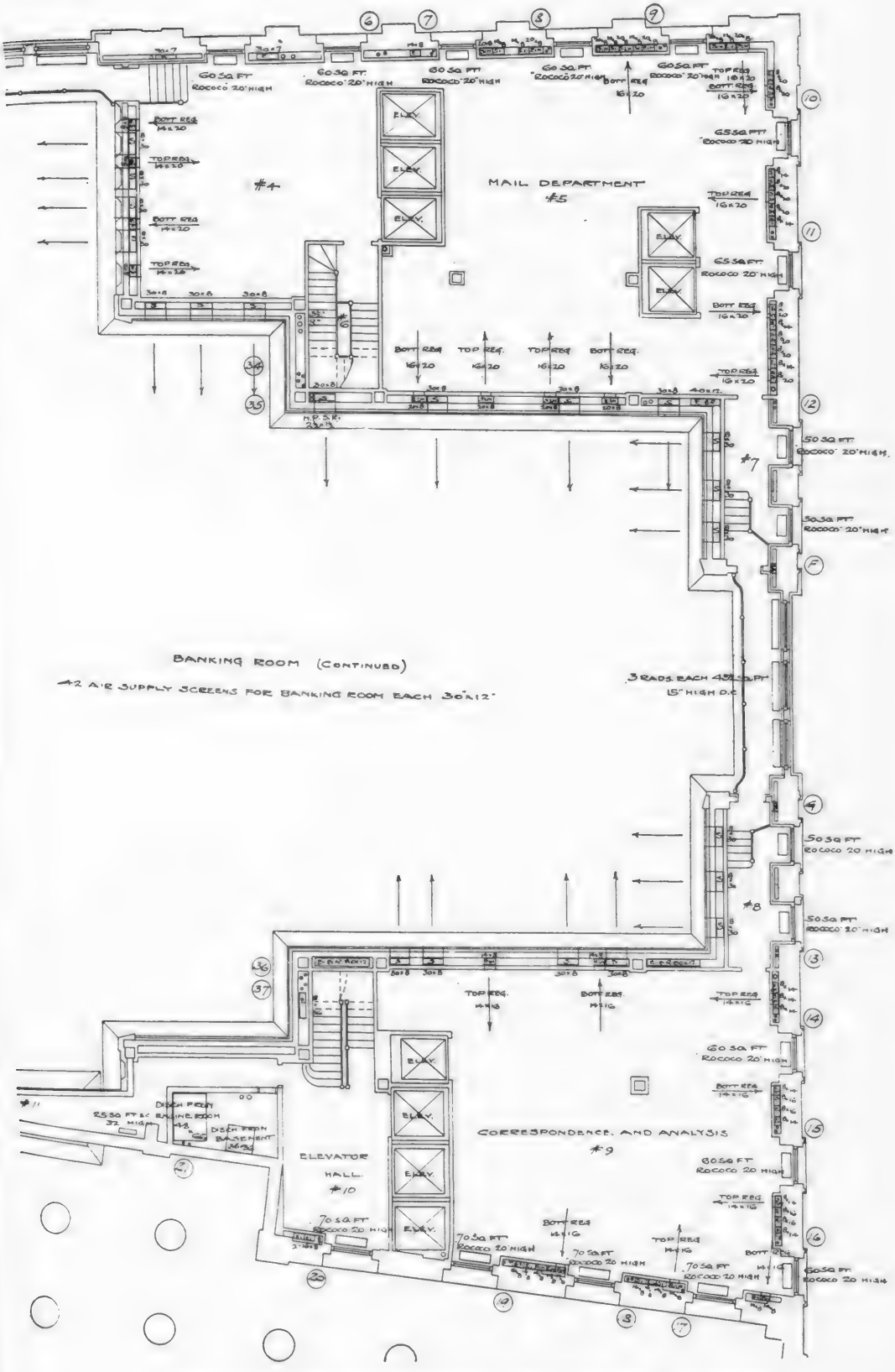
DETAIL OF SECTIONAL PLAN, SHOWING ARRANGEMENT OF AIR SUPPLY APPARATUS ON THIRD FLOOR



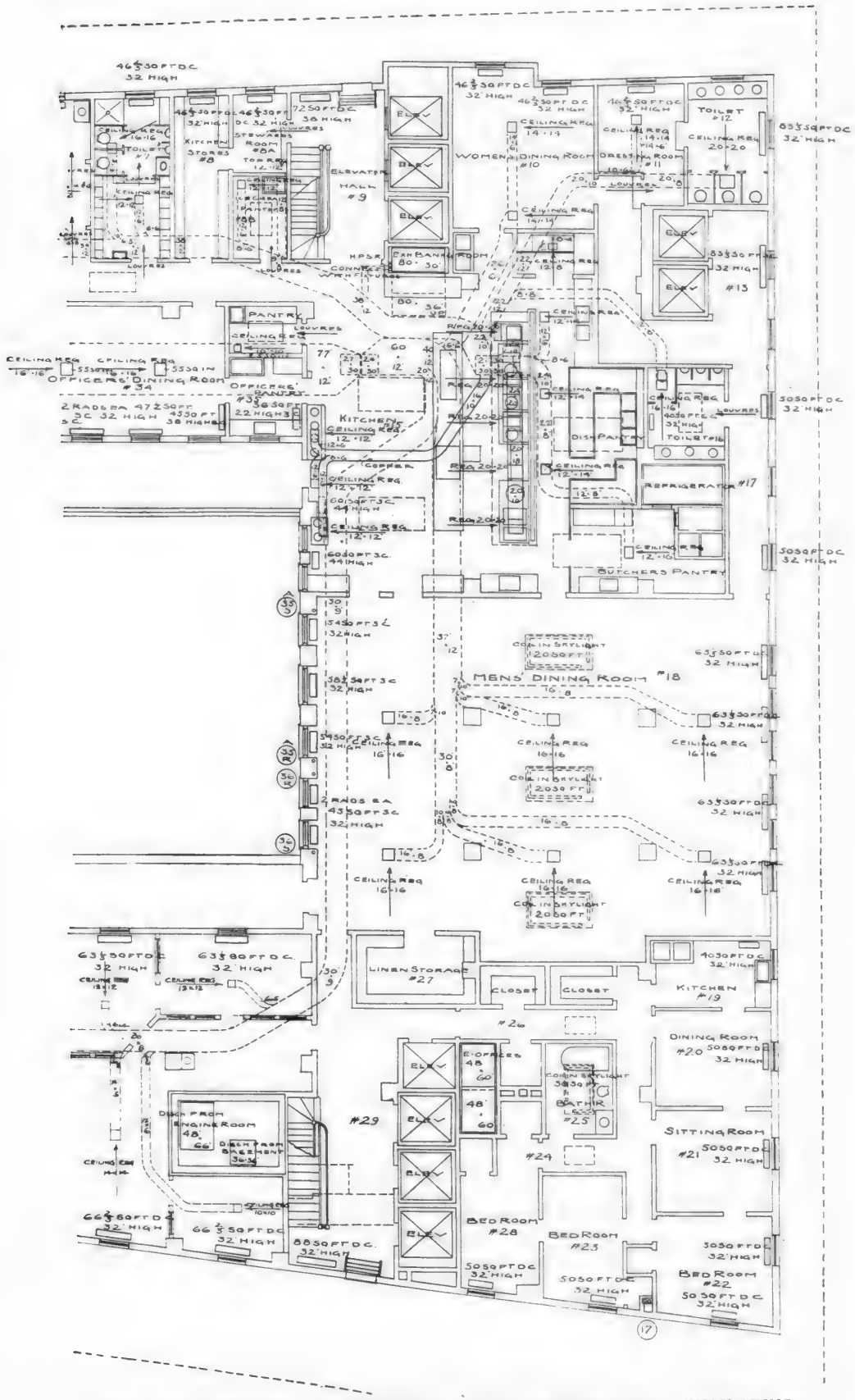
SECTION THROUGH BLOWER ROOM, THIRD MEZZANINE FLOOR



PART PLAN, FIRST MEZZANINE FLOOR, NATIONAL CITY BANK



PART PLAN, SECOND MEZZANINE FLOOR, NATIONAL CITY BANK



PART PLAN OF ROOF HOUSE, NATIONAL CITY BANK, SHOWING VENTILATING SYSTEM FOR DINING ROOM, ETC.

erating plant at some future time. The vapor pipes from the receiving tank, drip tank, and from each of the tanks of the automatic pumps and receivers, are connected into the vertical vapor pipe, as are the vapor pipes from the separator tank of the vacuum system, from the pump discharge of the drain pumps, from each section of the cooling coil and water seal.

A special line of high-pressure steam piping runs to the inspection space below and around the bank's vault, and is provided with outlets and double nozzles, looking up and down, spaced on about 36-in. centers. This line, which may be operated from the boiler room or from the president's room, is for the protection of the vault in case of attempted burglary or riot. The valves in the banking room are contained in a glass case, which has to be broken to obtain access to the valves.

After supplying the high-pressure apparatus, the steam mains are connected through a pressure reducing valve to the kitchen and other fixtures on the top floor, including pantries, serving room, and laundry, and to the hot-water tanks.

There is also a low-pressure steam supply and return system for the radiators and coils in the building. The Webster return line vacuum system is used for the heating and ventilating apparatus. A separate low-pressure steam main is run to the tempering coils, with a separate return main to the vacuum pumps. The discharge from the vacuum pumps connects with the separator tank and thence with the cooling coil, which discharges into the sewer. All the direct radiators are of the Peerless type, made by the American Radiator Co. The radiators in the galleries and on the banking room floor level are duplex radiators. The duplex radiators are controlled by separate inside and outside thermostats, so as to secure heat at all times below the large windows and to counteract the down draft from these windows at all times.

The Johnson system of temperature regulation is installed, controlling the ventilating apparatus, hot-water tanks and direct radiators. The Johnson apparatus for automatically supplying and regulating the humidity for the air supplied is also used. The humidifiers consist of copper evaporating pans, fitted into the bottom of connections between tempering coils and blowers. Their action is controlled by operating the steam valves on the evaporating coils in such a manner as to maintain an even percentage of moisture in the air supply. The evaporating coils are of brass pipe fitted in the evaporating pans and divided into sections for hand control. There are automatic water feeders for each pan, with float valves and drain connections.

Messrs. McKim, Mead & White are the architects, and the late Alfred R. Wolff was the consulting engineer. The work was completed by Messrs. Nygren, Tenney & Ohmes, the successors to Mr. Wolff, through whose courtesy we were furnished with the plans published herewith, Mr. Tenney having the entire charge of the designing and the installation. The heating and ventilation contractors were G. A. Suter & Co., New York.

Advantages of Concrete Hot Water Tanks

Judging by the interest manifested in the subject of concrete hot water tanks, and by their specification and installation in preference to those of wood, it is apparent that the former have advantages warranted by their extra cost.

In a general way concrete is known to be a very poor conductor, and at the same time a very good resistant of heat. This knowledge is more specifically brought out when it is observed that steel reinforcement within 1 in. to 1½ in. of such a surface remains intact, and that the concrete itself undergoes little or no injury when subject to most severe heat conditions. An extreme example was recently reported by Mr. Leonard C. Wason, of the Aberthaw Construction Co., of Boston, Mass., where a floor 5 in. thick was subjected to a raging fire beneath at a temperature varying between 1,700° and 2,000° for a period of 5 hrs., and yet the hand could be borne on the top surface without fear of burning.

In the matter of cost, the reinforced concrete tank is without question higher, but its durability, freedom from leakage and its non-conductive properties make it a better investment for the storage of hot water.

A New Method of Heating and Ventilating Prisons

By John G. Eadie, M.E.

In the past few years there has been a general tendency toward improving the sanitary conditions in prisons; and one of the cardinal points considered has been that of heating and ventilating.

Modern prisons are built in the form of cell wings, often radiating from a central guardhouse. Each cell wing consists of a long building having windows on both sides, and the cell block in the middle. This cell block runs the length of the building, and consists of rows of cells placed back to back so that all will be open toward the light.

The cells are built in tiers, 2, 3 and 4 or more high. There is a wide corridor for the use of the keepers, open from floor to roof and running the length of the building on each side between outside walls and cell block. Also there is a narrow utility corridor in the center of the cell structure between the backs of cells, to give access to plumbing pipes, etc.

To get an adequate supply of fresh air into all parts of such a building, filled with men confined in cells hardly large enough to stretch in, necessarily requires forced ventilation, and this is being quite generally adopted. The vitiated air is generally exhausted from the top, and in some cases indirect heat has been used, warm air being blown in along the side walls. More often direct heat alone has been used, radiators being placed under the windows.

In any case, the difficulty has been to heat the lower tier of cells while preventing the upper ones from becoming overheated. An attempt to overcome this difficulty has been made at times by dividing the keepers' corridor into two or more stories with glass floors, but this has the objection of preventing a full view of the cell structure, necessitating more keepers and interfering more or less with the light.

In planning the heating and ventilation for the new Riker's Island Penitentiary, the writer, in association with Percival Robert Moses, consulting engineer, has used a method aimed to overcome this objection.

Air is exhausted from an opening in the rear of every cell and discharged out through the roof; fresh air is thus induced into the cells through the open grated doors from keepers' corridor.

The air in this large open corridor is, therefore, not subject to contamination and may safely be kept in circulation to maintain a fairly uniform temperature for all the cell levels.

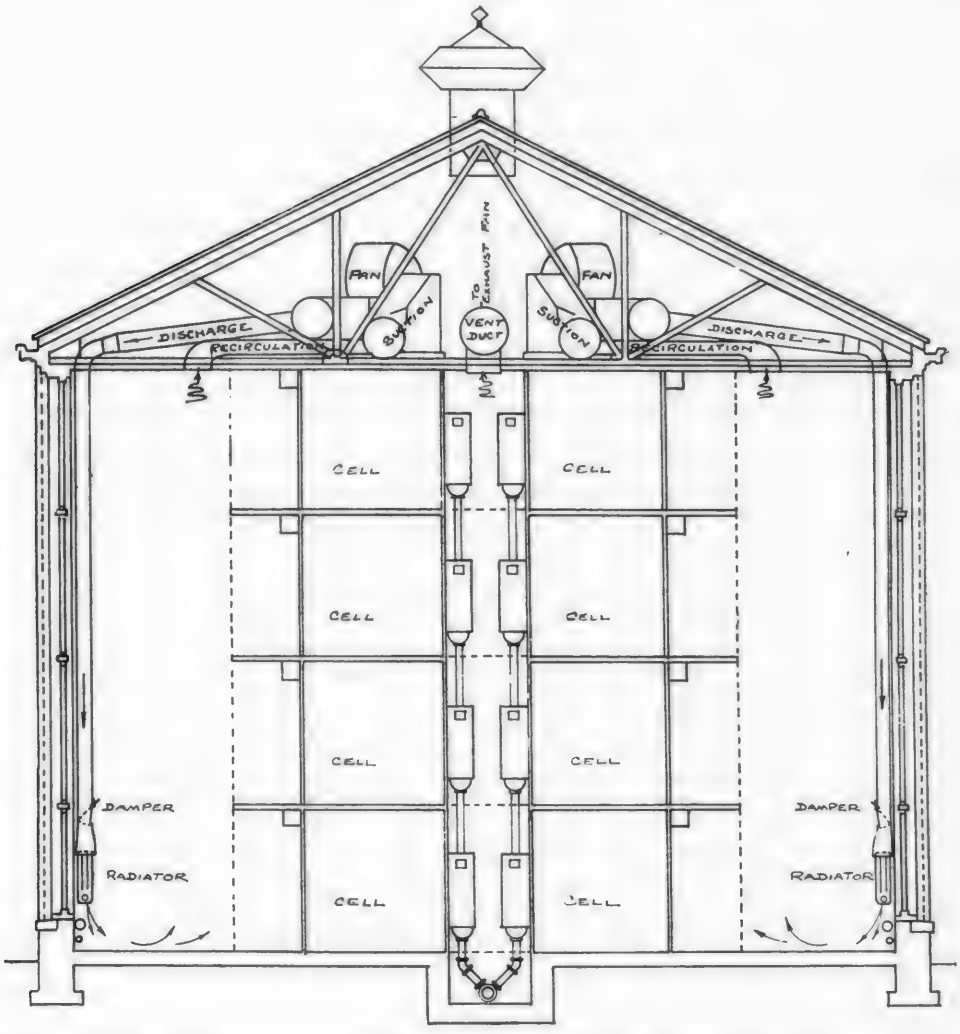
To accomplish this, direct radiators of the flue type are placed along the side walls, and air is kept in circulation by fans blowing it from the top of the room down over radiators which reheat it; thence it spreads over the floor of corridor, and, in rising, part of it is drawn into the cells, all getting about the same temperature.

The method by which this is accomplished is shown in the accompanying sketch. Registers are provided at intervals in the ceiling of keepers' corridor to permit the rising, heated air to escape into ducts which lead to the suction side of fans placed in the roof space as shown.

From the fans it is blown back through other ducts leading down the side walls between windows and through the radiators as just stated.

While this process continues as long as the fans are kept in motion, only a portion of the air blown down returns again to the fan, the rest of it being drawn into the cells and out through exhaust fans. Consequently an amount of fresh air equal to that exhausted is constantly being drawn in from outdoors, tempered and mixed with the air recirculated.

In addition to the flue radiators over which the air is blown, there are other direct radiators placed between them and proportioned for heating during the day when the prisoners are in the workshop and fans need not be run.



CROSS SECTION THROUGH CELL WING, SHOWING HEATING AND VENTILATING SCHEME

To get the full benefit of the flue radiators when used without the fans, dampers are placed in ducts just above them to deflect the heat out into the room, instead of up the flue. These dampers are operated automatically by a three-way valve placed near each fan motor, which admits compressed air to a diaphragm at each damper.

While enabling the building to be kept warm without using fans, the direct radiators have the further advantage, when used in conjunction with fans, of heating the cold air currents falling over extensive window surfaces. In this connection, the flue type of radiator, with long nipples between sections to increase air passage, makes a very effective reheater, with its attendant advantage of obviating the necessity for blowing hot air through ducts in roof space and consequent overcoming loss of heat or the use of expensive covering.

Experiments made with the type of radiator described under the above conditions have shown, as was to be expected, an efficiency much greater than when acting as direct surface. Even with the moderate air velocity of 10 ft. per second downward through radiator, the efficiency is doubled.

THE HEATING AND VENTILATING MAGAZINE

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WE CELEBRATE with this issue the fifth anniversary of the founding of THE HEATING AND VENTILATING MAGAZINE. The first number was published in June, 1904, and saw the light of day at the Atlantic City convention of the master steam fitters. While the intervening period is not a long stretch, as time is usually measured, it has been, nevertheless, part of a most interesting epoch in the development of heating and ventilation as a distinct and separate science in the realm of mechanical engineering. Nor is this to be wondered at, when we consider that men still living can recall the time when the heating business was in its infancy.

If we have contributed in any appreciable measure to this development, the purpose of the founders will have been more than fulfilled. There is little doubt in the minds of those who have given any attention to the subject that the development thus far has been comparatively little more than a scratching of the surface. This is said with reserve, and applies, perhaps, more particularly to the practical side of the business—the mechanical improvement of appliances and the wider use of mechanical as distinguished from natural ventilation in the office and home.

It is this phase of the situation that immediately arises to the mind in considering a trade anniversary. What, we are prompted to ask, will the next five years bring forth in the heating trade? And what will be the line of development during the ensuing five years? Will any progress be made, for instance, during that time, or later, in the practical utilization of the enormous heat supply furnished us by the sun's rays? Electrical engineers are already giving the matter serious thought, and the possibilities in this direction are by no means as chimerical as they might appear.

Turning to the subject of ventilation, how long will it be before a residence or office building, to say nothing of a more public structure, that is built without any means of definitely and regularly changing its air, will be considered a monstrosity, very much as a building without means for heating it is now considered? Looked at from this point of view, the profession of heating and ventilation has an almost limitless future before it. As one engineer has said only recently, its field is rapidly becoming as wide, if not wider, than any other branch of mechanical engineering.

There is, therefore, much to be done, and THE HEATING AND VENTILATING MAGAZINE will hope to bear its share in the future, as in the past, in the advancement of the cause.

AS ONE of the steps towards this end, we will inaugurate in an early number a department devoted to the "Mechanical Equipment of Buildings." This will include more particularly those portions of the plant which it has been customary to provide for in the heating and ventilating specifications. Indeed, the heating engineer nowadays must take a direct interest in practically all the features of the mechanical equipment of his building, and this frequently includes not only the power plant itself but the refrigerating machinery, vacuum sweeping outfit, hot-water supply and, in some cases, steam cooking and other appliances.

It will be the purpose of this new department to keep the reader abreast of the developments that are taking place in these subjects, and to give him such trade information regarding them as will keep him posted on the more important changes that occur.

WAS IT merely a happen-so, or was there knowledge aforethought in the presentation of the following topic at the last meeting of the heating and ventilating engineers' society: "State control for heating and ventilating engineers?" On that occasion, it will be remembered, there was a very decided expression of opinion against such a proposition, not only on account of the precedent it would establish, which might involve engineers in other professions and thus create needless confusion in the practical operation of such a system, but also on account of the fact that heating engineers already have a means of qualifying as expert and competent through membership in their society itself.

"It seems to me," said one speaker, "it would be difficult to establish a standard, unless it be the standard we have already established in this society. If you have state control, you must have some standard. The man who applies for his license must be known to some one as a man competent to design and install heating and ventilating plants. That means he must have the qualifications for membership in this society, so if we have state control we must practically have a law to the effect that in order to practice in the state an engineer must be a member of this society. Is it not far better for us to make our society such that the public will know that a man who is a member of it is fully competent? Let us impress that upon the people, and we will need no law."

It now appears that the matter was more than an academic discussion, for the proposed new building code for New York City, which was recently made public, contains this significant provision: There is to be a board of registration before which every architect, engineer, master mason, master carpenter and master erector of steel or iron who wishes to be recognized as a builder must appear and apply for a certificate of qualification and competency. The board may dispense with an examination upon the presentation of satisfactory proof of his competency and that he has been engaged as a master builder, architect or engineer for ten years. "It may limit the examination and registration to such class of persons as it may deem proper, and may revoke and cancel a certificate of qualification and competency for a limited or unlimited term."

CORRESPONDENCE

Heat Emission from Radiators and Heat Losses from Buildings

EDITOR HEATING AND VENTILATING MAGAZINE:

There is an important problem which I hope may have the thoughtful attention of engineers with a view of an early and satisfactory solution. I refer to the ratio of heat emission from radiating surfaces, and heat losses from buildings.

These are ordinarily assumed to be in direct proportion to the differences in temperature. It seems now to be well established, however, that this ratio is not a direct one. It is well known that the amount of radiating surface required to heat a building from 35° to 70° is less than half that required to heat it from zero to 70°, while much more than 2/7 additional is needed to heat it from minus 20° to 70°. This is also true as regards the temperature of heating media. As the latter approaches the temperature of the room the heat emission per square foot of surface decreases, and it decreases faster than the temperature difference, and vice versa.

WILLIAM H. BRYAN.

St. Louis, May 23, 1909.

Heat Transmission Effect of Solid Concrete Floors

EDITOR HEATING AND VENTILATING MAGAZINE:

You may be interested in an experiment made a year or two ago with reference to the heat transmission effect of solid concrete floors. In buildings built of solid re-enforced concrete, the floors are directly connected to the side walls. This permits heat transmission from the floors to the walls, which, to my knowledge, has always been neglected in figuring the heat losses in a building. In order to determine whether this had any definite effect or not, the following experiment was made:

A hole was drilled in the outside wall and another in the inside wall of the building which was a solid brick construction. Then holes were drilled a foot apart at right angles to the wall at a distance of 6 ft. from the wall. The room was maintained at 70° by means of thermostatic control. The temperature shown by these thermometers proved conclusively that there was a loss of heat by conduction from the floors to the walls. The general conclusion reached from this experiment was that in determining the heat loss from the building having solid concrete floors at least 1 ft. of the floor should be added to the wall surface. That is, the walls should be considered at least 1 ft. higher in order to make up for the loss from the walls and floor. The writer does not feel that this figure is exactly correct, but it has not yet been sufficiently well determined to be exact. It is probable that more should be added than the figure given above.

JOHN R. ALLEN.

University of Michigan,
Ann Arbor, Mich., May 26, 1909.

A Word of Appreciation

EDITOR HEATING AND VENTILATING MAGAZINE:

I note your intention of making the June issue of your magazine a Special Anniversary Number. I shall look forward with pleasure to this issue as, in fact, I do to all its numbers. I regard THE HEATING AND VENTILATING MAGAZINE as one of the very best technical magazines.

E. M. SHEALY.

Professor, College of Mechanics and Engineering, University of Wisconsin.
Madison, Wis., May 22, 1909.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Arrangements for Summer Meeting

As already announced in these columns, the semi-annual meeting of the society will be held at the Claypool Hotel, Indianapolis, Ind., Thursday and Friday, July 15 and 16, 1909, with sessions at 10 A. M. and 2 P. M. The Claypool Hotel has made a special rate of $2.00 per day and upward on the European plan, and $3.00 per day and upward on the American plan, to members and others attending the meeting, with a reduction of 50 cents per day each where two persons occupy the same room. Papers and topics for discussion, to be presented at this meeting, should be in the hands of the secretary before June 20.

Federal Furnace League

A successful meeting of the Federal Furnace League was held at Atlantic City, May 10, when the following officers for the ensuing year were elected: President, Charles S. Prizer, Philadelphia; vice-president, Fred E. Lee, Dowagiac, Mich.; treasurer, Joseph F. Kernan, Syracuse, N. Y.; secretary, Wilson Ferguson, Mint Arcade, Philadelphia; executive committee, D. Rait Richardson, New York; Joseph F. Kernan, Syracuse; A. W. Williamson, Cincinnati; A. E. Stockbridge, Boston; Fred. E. Lee, Dowagiac; Frederick H. Moore, Utica; Charles S. Prizer, Philadelphia.

New York's Proposed New Building Code

The new building code proposed for New York, which has aroused so much speculation in the building trades, has been made public. Before being finally acted upon, the building committee will grant public hearings upon the measuse which are expected to arouse extended discussions.

As summarized by the *Record and Guide* the proposed building code contains the following provisions which affect or are of direct interest to heating and ventilating engineers:

The Code considers and provides for in Chapter 2 a board of examiners, a board of registration and a committee of surveyors. So far as the board of examiners is concerned, this is merely a recognition of the requirement of the charter in this respect (which should receive the attention of builders and property owners in order to secure proper representation). But the requirements for a permanent Board of Registration and a permanent Board of Surveyors are new propositions. Special or temporary boards of surveyors only are required at present.

There is to be a board of registration before which every architect, engineer, master mason, master carpenter and master erector of steel or iron who wishes to be recognized as a builder must appear and apply for a certificate of qualification and competency. This board may provide for either an oral or written examination of the applicant, or both, and shall dispense with an examination upon the presentation of satisfactory proof of his competency and that he has been engaged as a master builder, architect or engineer for ten years.

"It may limit the examination and registration to such class of persons as it may deem proper, and may revoke and cancel a certificate of qualification and competency for a limited or unlimited term. The said board shall have power to establish general rules and regulations for the purpose of exercising the powers and discharging the duties conferred and imposed upon it by this code, and shall have power, from time to time, to amend or repeal such rules and regulations."

Great power, it is plain, is given to this board—to say who or who may not be a builder in New York, and to be a law unto itself. The only other registered craftsmen in New York are the plumbers. The State would have the power of repeal, and also the Board of Aldermen, this being a proposed city ordinance merely.

POWERS OF THE SUPERINTENDENT

The general powers and duties of a superintendent (or commissioner) are not made the subject of separate and distinct sections in the existing law, but in the new one Chapter 3 is taken up almost altogether with the duties of the Superintendent of Buildings. He is to register "engineers, architects, carpenter or mason builders and master erectors of iron and steel work."

"He is to approve or disapprove applications and plans, to issue permits, notices and certificates, to make rules and regulations, to decide upon and make orders in relation to variations and modifications, to pass upon questions relative to the mode, manner of construction or materials to be used in the erection or alteration of a building, to require that such mode, manner of construction or materials shall conform to the true intent and meaning of the several provisions of this code; to authorize the Corporation Counsel to institute any and all actions that may seem proper or necessary for the enforcement of its provisions."

He is also to keep an account of moneys, a record of applications, and shall in January of each year compare a complete lit of materials and appliances which he has tested and approved; and when it is claimed that an equally good and more desirable form of construction can be employed in any specific case, or where there are practical difficulties in the way of carrying out the strict letter of the code, so that the spirit thereof shall be observed, public safety secured, and substantial justice done, the Superintendent of Buildings shall have power to vary or modify its provisions.

CAN EXPEDITE OPERATIONS

The method prescribed for the filing of plans is the same as prescribed by the present law, but there is this notable difference: In case adequate plans and statements are presented, the Superintendent may at his discretion issue an approval and permit for the construction of a part of a building before the approval of applications and plans of the complete structure. This would facilitate the commencement of building operations.

AREA LIGHT AND VENTILATION

All buildings hereafter erected must have courts open and uncovered to the sky from the top of the second story floor beams, but in buildings having sleeping accommodations in the first story the courts must start at the top of the first story floor beams. For tenement houses the courts must be in accordance with the Tenement House Act in this respect. The area of such courts in Class C buildings shall not be less than twenty percentum of the total lot area for buildings not exceeding 75 ft. in height, and not less than 25 per cent. for buildings not exceeding 150 ft. in height.

Current Heating and Ventilating Literature

Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the articles mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

ISOLATED PLANTS

Isolated Plant vs. Central Station. A letter addressed to the Board of Estimate and Apportionment of New York City, by Percival Robert Moses, giving reasons why a private isolated plant should be installed in the New York public library. 2500 w. Power—April 27, 1909. 20c.

MINE VENTILATION

An Inquiry into the Ventilation of Coal Mines and the Methods of Examining for Firedamp. Information from Prof. Cadman's report of investigations made for the Royal Commission. 3000 w. Ir. & Coal Trades Rev.—March 26, 1909. Serial, 1st part. 40c.

POWER PLANTS

Power Plant of West Point Military Academy. 6000 w. Power—April 27, 1909. 20c.

STEAM PIPES

Danger from Water Hammer in Steam Pipes. Howard S. Knowlton. Ills. 2000 w. Power—April 20, 1909. 20c.

Explosion of Steam Pipes Due to Water Hammer. C. E. Stromeyer. Read before the Inst. of Nav. Archts. 4500 w. Mech. Engr.—April 9, 1909. 40c.

VENTILATION

Principles of Heating and Ventilating a Modern Building. H. W. Woodward. General discussion, with illustrated description of the heating and ventilating system of the Cuyahoga Co. Court House, Cleveland, O. 5000 w. Ind. Engng.—April, 1909. 40c.

The Weather for May

The weather during May, 1909, was normal in most parts of the country and, as usual, there were a few days on which heat was required.

Owing to the early date on which this issue is published, the weather reports were received too late for insertion in chart form. In order to complete the record, they will be published next month.

NEW YORK

Highest temperature, 83° on the 14th; lowest temperature, 40° on the 2d; greatest daily range, 25° on the 12th; least daily range, 6° on the 27th. Mean temperature for the month, 60°, corresponding to the normal for 39 years. Total rainfall, 1.72 in. about 1½ in. less than usual. Total wind movement, 9,169 miles, mostly from the northwest.

BOSTON

Highest temperature, 83° on the 6th; lowest temperature, 38° on the 1st; greatest daily range, 33° on the 6th; least daily range, 4° on the 17th. Mean temperature for the month, 56°, 1° below the mean of this month for 39 years. Total rainfall, 2.33 in., 1 in. less than usual. Total wind movement, 8,143 miles, mostly from the east.

PITTSBURG

Highest temperature, 84° on the 15th; lowest temperature, 35° on the 2d; greatest daily range, 32° on the 12th; least daily range, 7° on the 28th. Mean temperature for the month, 60°, 3° less than the mean of this month for 39 years. Total rainfall, 1.51 in., about 1¾ in. less than usual. Total wind movement, 7,477 miles, mostly from the west.

ST. LOUIS

Highest temperature, 87° on the 5th; lowest temperature, 35° on the 1st; greatest daily range, 27° on the 6th; least daily range, 8° on the 13th. Mean temperature for the month, 64°, 2° below the mean of this month for 37 years. Total rainfall, 5.99 in., 1½ in. more than usual. Total movement of wind, 8,298 miles, mostly from the southeast.

CHICAGO

Highest temperature, 86° on the 5th; lowest temperature, 32° on the 1st; greatest daily range, 35° on the 5th; least daily range, 6° on the 10th. Mean temperature for the month, 56°, corresponding within ½° to the mean of this month for 39 years. Total rainfall, 2.18 in., 1⅓ in. less than usual. Total wind movement, 11,664 miles, mostly from the northeast.

New Books

Heat for Engineers, a treastise on heat, with special regard to its practical applications, is a noteworthy work by Charles R. Darling, Lecturer in Heat at Finsbury (England) Technical College. The book forms one of the Finsbury Technical Manuals. The subjects taken up include refrigerating machinery, ice manufacture, cold storage, fuels and pyrometry, the object of the author being to deal with the numerous applications of heat in modern industrial processes and to furnish the information and data requisite for a correct understanding of the thermal phenomena involved. Care has evidently been taken to include the most recent and reliable data in the numerous tables and the various formulae are illustrated by examples embodied in the text. The book is fully illustrated. Besides the subjects mentioned, chapters are devoted, respectively, to methods of producing heat, practical applications of the property of expansion, general properties of gases,

practical applications of fusion and allied phenomena, vapors, ebullition, latent heat of evaporization, properties of steam, atmospheric moisture, hygrometry, production of low temperatures, and conversion of heat into work, with the laws of thermodynamics and practical heat engines. The subjects are fully indexed. Size, 5½x9 in. Pp. 430. The American publishers are Spon & Chamberlain, 123 Liberty St., New York. Price of book, $5.00.

Underground Insulation of Steam and Hot Water Pipes

During a discussion of a paper by Harry Gillett on "Underground Insulation of Steam and Hot Water Pipes," read at the November meeting of the Ohio Society of Mechanical, Electrical and Steam Engineers and published in THE HEATING AND VENTILATING MAGAZINE for November, 1908, Mr. A. C. Rogers, who has the supervision of miles of underground pipes distributing thousands of gallons of hot water from the various plants of the Toledo Ry. & Lt. Co., was asked as to the number of service connections, the number of square feet of radiation and how extensive the Toledo plant really is.

Mr. Rogers answered that his company assumed the ownership of the old Yaryan system some time ago, having approximately 20 miles of mains and service pipes underground. He stated that they are confronted by serious problems incident to expansion of their own systems, as well as changes necessary on account of the installation of large sewers which have the right of way in highways and often compel the removal of steam and hot water pipes which were quite adequate to meet the demands at the time of installation. He referred to the importance of installing such systems with a view of permanency, using large pipes in preference to a number of small ones and of putting in the best of material.

An Important Combination in the Heating and Power Line

An important combination in the engineering and mechanical equipment business in the East is announced in the association of James M. Harrison, of New York, with the Quay Engineering Co., 1123 Broadway, New York. The Quay Engineering Co. is an old-established engineering firm in heating, ventilation and mechanical equipment, and also acts as manufacturers' agent. D. M. Quay is a charter member and former president of The American Society of Heating and Ventilating Engineers and has designed and installed the mechanical equipment in a great number of high-class buildings throughout the country.

Mr. Harrison was, until recently, connected with Evans, Almirall & Co., New York, heating, ventilating and power plant engineers, in charge of the engineering department and has had many years' experience in vacuum steam heating with the Paul System Co., and in mechanical ventilation and blast work with the B. F. Sturtevant Co. Their combined technical and practical experience gives them a decided advantage and should result in great success.

New Publications

The purification of boiler feed water is the subject of two charts reprinted from well known authorities upon this subject, by the Harrison Safety Boiler Works, 3189 North 17th street, Philadelphia, Pa. The charts show that the purification of water for boiler feeding purposes can be accomplished in a commercially successful manner by the proper application of heat and soda ash, that is, that these two remedies will entirely protect the boilers from corrosion and from the formation of hard scale, since boiler feed water should be heated in any case, and since heating water by spraying through steam takes the place of the caustic lime or caustic soda used in other processes for taking up carbon dioxide. This hot process system is claimed to be the rational method of converting cold, hard water into hot, soft water for boiler feed purposes. The hot process apparatus designed and built by the above company combines all the functions of an open feed water heater with those of a softening system, and the fact that a feed water heater should be installed in any case thus makes it comparatively inexpensive to secure softening in addition.

Canadian Asbestos Discovery

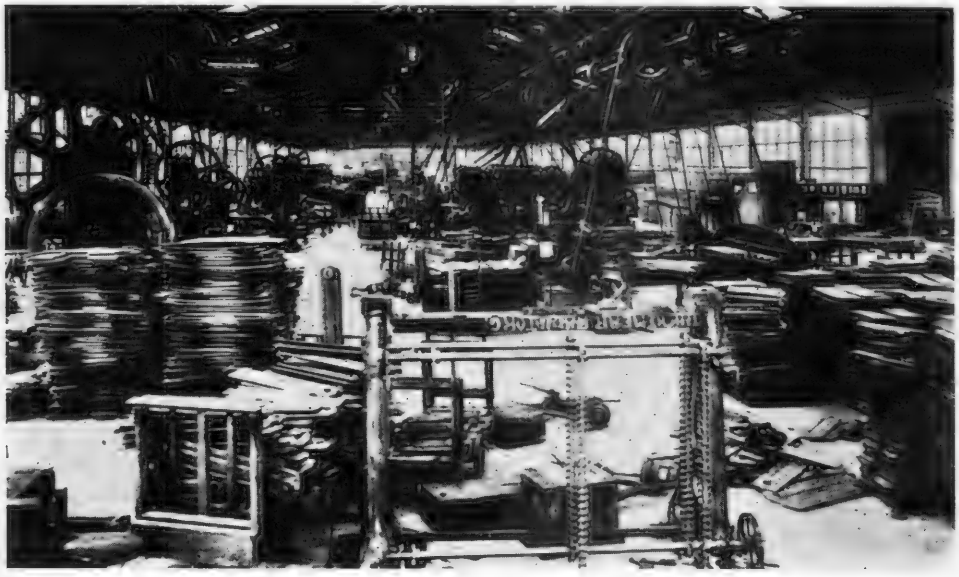
Consul Paul Lang reports from Sherbrooke that asbestos has been discovered near Eastman, Quebec, and that several companies have organized to develop the new mines. The Consul continues:

The Orford Mountain Railroad is near these properties, and a spur will be built from the main line to the mills, which are already in course of construction. This discovery is important, as bearing on the extent of the asbestos fields in this province. The mines near Danville, Quebec, some 65 miles from this new find, and at Thetford Mines, Black Lake, and Broughton, Quebec, and several smaller places on the line of the Quebec Central Railway, about 100 miles from Eastman, are now the only producers of this mineral on this continent, with the exception of a small output in Vermont and a new mine in Georgia. The development of these new mines will induce more thorough prospecting all over the eastern townships.

A Twentieth Century Product

As this is the age of stamped products, which are rapidly replacing those formerly made from core castings, etc., it is interesting to learn of the remarkable strides made in the stamping of pressed metal radiators for steam and hot water heating.

The plant of The Pressed Radiator Company of America, manufacturers of Kinnear pressed radiators in the Hecla, Eureka, Beaver and Duquesne models is one of the most modern for the manufacture of radiators in the world. The entire plant, which covers approximately 2½ acres, is constructed from steel and concrete. A railroad siding measuring 1,500 feet long, connects the entire plant with several different trunk lines.



CUTTING, STAMPING AND ASSEMBLING DEPARTMENT, WORKS OF THE PRESSED RADIATOR COMPANY OF AMERICA

The plant is equipped with the most modern machinery obtainable; all presses being automatic and operated by electricity. The machinery is arranged in such a manner that the sheets are unloaded at one end of the works, are then conveyed to the different sized shears and cut into the sized section of radiator required. After that, they are sent through the different stamping operations and finally reach the end of the works crated and in condition for shipment. The entire manufacturing operation is continuous. An observer can follow the process from the raw material in the course of construction, through the entire factory, until it comes out a finished radiator crated and ready for delivery.

Kinnear radiators are made from dephosphorized and decarbonized sheets, No. 20 to 18 gauge, specially rolled to our specifications, carefully inspected and avoiding the undesirable properties of modern steel sheets. Therefore, the claim as to the non-corrosive nature of the metal used is substantially based. An extra precaution is taken, for besides using the best grade of metal obtainable, the interior and exterior of the radiators are thoroughly galvanized under the best known process, thus adding a double protection against impurities in water.

The joints and connections of the different models of radiators are constructed with the double, interlocking seam and are machine made, being formed with dies and machinery especially designed for the purpose, the joints are so locked and seamed together that it is impossible for them to part, except under unusual, excessive pressure. Each radiator after being assembled, is tested by a hydrostatic pressure of 35 lbs. to the square inch.

The durability of any radiator, cast iron or sheet metal, can be equal only to the strength or life of its weakest part, which in the case of cast iron radiators, are the high-carbon steel nipples used to connect the sections. If these common push nipples and the equally common pipe radiators so popular years ago and still in use have the durability of many years, it is reasonable to make the same claim for pressed metal radiators, which are not only constructed of material much superior to the material used in the construction of steel nipples, but is thoroughly galvanized inside and out, thus adding a double protection. It is also reasonable to claim as long a life for pressed radiators as that attained by

INTERIOR VIEW OF MAIN BUILDING, WORKS OF THE PRESSED RADIATOR COMPANY OF AMERICA

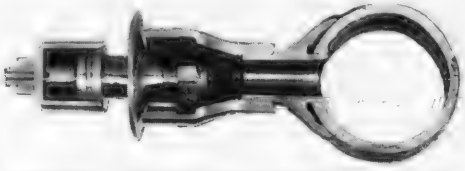
thousands of unprotected sheet radiators now in use in New England which were installed over forty years ago and the manufacturing of which was abandoned only because of the excessive cost.

The rapid growth of the pressed metal radiator industry the past few years in this country has been marvelous, and only when one stops to consider the many advantages of the pressed metal radiator in that they are strong, light, durable, compact, sanitary, quick acting and attractive, can one appreciate the cause of its rapid strides in popular favor.

NEW DEVICES

Spray Nozzles of the McCreery Air Washers

The spray head shown in the accompanying illustration are those used with the McGreery Type A air washer and are known as the McCreery improved piston heads having water under pressure in the cylinder opposing the pressure of the spray water. All the cylinders of these spray heads are connected through a three way cock conveniently located near the pump. The McCreery spray head is designed to handle water contining a large portion of suspended matter in the air, such as lint and similar substances. In the type of head shown, which is that used in the Secor Hotel installation, described on another page of this issue, there are no springs, levers or similar pieces to become clogged and to stick. The head is composed of a minimum number of pieces and can, therefore, easily be kept in adjustment. The pressure of the water producing the curtain can be instantly changed to regulate the pressure of the water used in the cylinders, by means of a reducing valve. A single throw of the lever of the three way cock shuts off the water supply to the heads, allowing the spray water to force the piston back and to flush the heads. The lever of the three way cock may then be brought back to its original position, again admitting water to the cylinder and instantly re-



PISTON CONTROLLED SPRAY HEAD OF McCREERY AIR WASHER

storing the curtain. In the Secor Hotel installation, as in other similar cases, electric lights enclosed in vapor proof globes are installed in each washer and marine dead light windows are provided for through inspection at all times. Access to the washers is by means of cast-iron doors, provided with rubber gaskets and belted down with dogs.

The Autoforce Ventilating System

The distinctive feature of the Autoforce Ventilator is that it is constructed mechanically to create a constant, unbroken suction flow of air and prevent the possibility of its flowing downward.

The working of the Autoforce ventilator in apparently a calm or no breeze whatever, is explained as follows:

On a sunny day the inside deflector is protected from the sun; the outside deflector has a tendency to draw the rays of the sun, causing an intense heat, therefore the air between both cones becomes superheated and expands, forming a syphon which forces the impure air out of the mouth of the deflector.

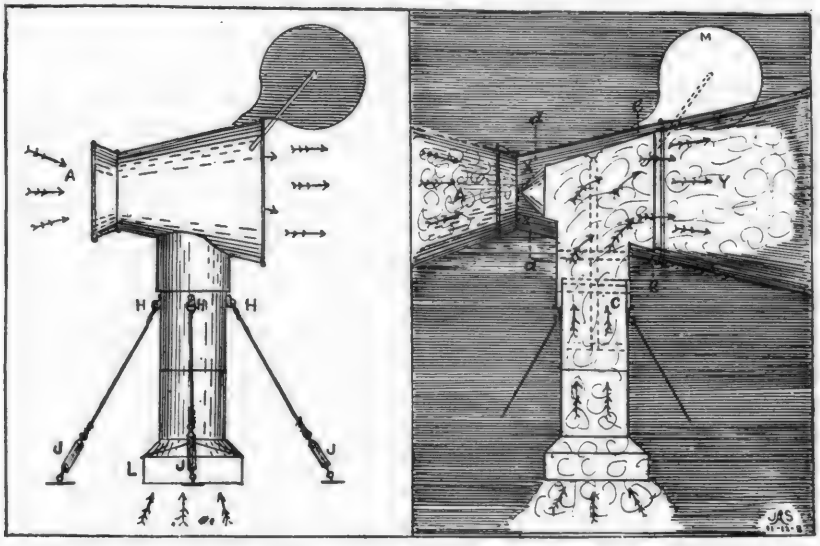
The body of air necessary for life is 14 7-10 lbs. per sq. in. atmospheric pressure. This air flowing into the small end of the Autoforce ventilator and passing through this superheated space, increases in pressure, giving the necessary capacity for ventilation, circulation of air and lifting power.

The movement of the air has never been recorded less than one to two miles per hour. This slight movement, barely noticeable to the naked eye or sense of feeling on the ground level, is used by this device to give it the needed power to produce perfect ventilation.

In an anemometer competitive test with one of the best known stationary ventilators on the market, conducted by several engineers, the result showed ten times the number of cubic feet of air displacement in favor of the Autoforce air pump.

The principle upon which this device operates is as follows:

The air entering at A (shown in the illustration) is split or spread out by the point of the inner cone and obliged to spread into a conical form in the passage X, but as the passage X keeps getting larger in area, this air is thereby compelled to occupy more and more space, and hence becomes thin or attenuated in its attempt to do so, and the result is that it increases its speed or is a true forced-draft, precisely on the same principle as the injector. Upon reaching the outlet at Y, Y, the outward rush of air from between the two cones causes a vacuum in the interior of the inner cone. As this vacuum must be filled or occupied, it causes a rush of air up the pipe C, and this rush is necessarily continuous, as the pull of the air at Y, Y, never ceases.



THE AUTOFORCE VENTILATOR AND ITS METHOD OF OPERATION

The Common Sense Exhaust Head

An interesting device shown in the accompanying illustration, known as the Common Sense Exhaust Head, is patented and manufactured by Stranditz & Scott, Camden, N. J., and sold by The Covering & Supply Co., eastern distributors, 232 West St., New York. It is designed to obviate the use of any complicated parts such as baffle plates. The expansion, for instance, is provided for by the ample size of head, while the condensation is caused by the expansion of the steam, together with the large cooling area with which the steam is brought into contact. The oil and water from the exhaust steam is separated by centrifugal force.

This head is made of heavy galvanized iron, of weight and gauge corresponding to size—riveted and joints soldered. The inlet pipe directs the steam tangentially to the top of drum, where the force of the exhaust drives it in circle around the head, while it gradually expands and reaches the outlet pipe. The centrifugal force of this circular motion, together with the condensation of expansion and consequent lowering of temperature as well as the condensation on the sides of the head, assure expanded dry steam only being discharged.

The expanding steam is not heated by contact with intake pipes inside the head.

The drip pipe being at the bottom, while the intake is at the top, there is no opportunity of the oil and water once thrown out, being caught in the incoming steam.

The depth of the discharge pipe into the head is accurately determined and is such that there is absolutely no back pressure,

THE "COMMON SENSE" EXHAUST HEAD

although the escaping steam is perfectly free from moisture and oil. Experience has shown that it is a perfect muffler.

The intake pipe is provided with standard cast-iron flange ready for connection, and at the bottom is rivetted a threaded drip flange of ample size.

This head was patented in 1897 and has been manufactured and sold with success for eleven years.

The Common Sense Exhaust Head is made for exhaust pipes from 1 in. to 20 in. in diameter and is listed at from $20.00 to $360.00. Larger sizes are made to order. The exhaust head is also made of copper.

A New Round Sectional Boiler

A new type of round sectional boiler, placed on the market by the Richardson & Boynton Co., New York, embodies a number of new features which mark the latest developments of this form of heater. A view showing the interior construction is shown herewith. It will be noted that the fire chamber with the water sections placed over it is constructed with corrugated surfaces, adding over one-third more square inches of heating surface for the fire to come in contact with, and over which the water passes, than has ever been heretofore embodied in any boiler. The result is that the full benefit of the coal is utilized in the heating of water to a high temperature with economy of fuel.

The fire-travel is staggered, the flue openings in the fire chamber being directly under water surfaces in the intermediate sections; and where two intermediate sections are used the openings in the second section are reversed. This same principle of heat economy is seen in the dome section, where all the heat and gases, after being in contact with the seven surfaces in the dome, pass through these surfaces to the back before reaching the smoke outlet.

The fire chamber is 17 in. deep from the grate to the center of the feed door opening, yet having a high combustion chamber, designed to maintain fire a long time without attention.

The grates are adapted to burning all kinds of fuel, and can be shaken, dumped or locked shut by the operation of a lock-plate on the front of the ash pit.

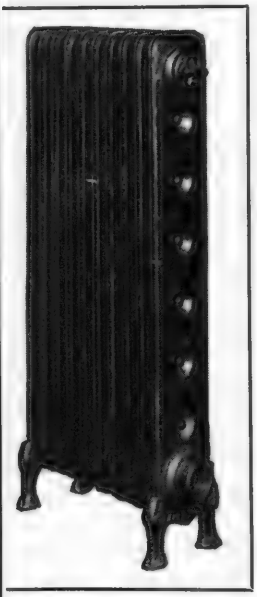
As shown in the illustration these heaters

SECTIONAL VIEW OF NEW RICHARDSON & BOYNTON STEAM HEATER

have cored openings through the firepot for inserting coil in the fire for heating water for domestic purposes.

These boilers are made with grates from 16 to 19 in. in diameter and are rated to carry from 250 to 1025 sq. ft. of steam radiating surface and from 400 to 1675 sq. ft. of hot water surface. They are fully described, with details as to dimensions, etc., in a new catalogue just issued by the company.

KINNEAR Double Interlocking Seam Pressed Metal Radiators



Are authoritatively conceded to be **vastly superior** to any other radiators.

They are

strong, durable, efficient, light, sanitary, compact, quick acting, economize in fuel, afford a large saving in freight, cartage and installation

KINNEAR RADIATORS

are a twentieth century product. They are being specified and used by the most eminent and discriminating architects and engineers for the better class of buildings and residences.

Any model can be placed **on the wall—off the floor—out of the way.** No extra charge for wall brackets or legs of standard sizes.

The Pressed Radiator Company of America

Representatives everywhere PITTSBURGH, U. S. A.

TRADE AND MISCELLANEOUS NOTES

Coming Events

June 24-26, 1909. American Institute of Chemical Engineers, Brooklyn, N. Y. Headquarters at Polytechnic Institute.

July 15-16, 1909. Summer meeting, American Society of Heating and Ventilating Engineers, Indianapolis, Ind. Headquarters at Hotel Claypool.

Death

Charles F. McCullough, treasurer of the Western Tube Co., Kewanee, Ill., died in that place April 24, of apoplexy. He was 59 years old and had been vice-president of the Western Tube Company since 1893.

Trade Literature

Eclipse Oil Filters and Continuous Oiling Systems are among the products of the Industrial Instrument Co., Foxboro, Mass., which are called to the attention of the trade in a newly-issued circular. The company announces that it is prepared to furnish and install complete oiling systems. The filters are described at length, with many illustrations, in Bulletin No. 1, issued as part of a sectional catalogue, and is devoted to both round and square types of the Eclipse oil filters, with price lists; oil storage tanks, rotary pumps and oil fixture fittings, drip pans and exhaust heads. Size 8x11 in. P. 28. Bulletin No. 2 is another interesting addition to trade literature, covering the company's full line of pressure and vacuum gauges, recording gauges and gauge boards. Size, same as Bulletin No. 1.

A Story in Black and White is the title of an attractive booklet on J-M asbestos roofing, published by the manufacturers, the H. W. Johns-Manville Co., New York. This roofing is an all mineral product, composed of pure asbestos and asphalt. Among its advantages are its fireproof qualities. It also does not need painting to protect it from the action of the weather, acids or gases. J-M asbestos roofing is supplied in rolls or flat sheets, as required. Included in the

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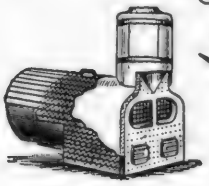

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85% MAGNESIA, ASBESTOS AND BRINE
PIPE COVERINGS, ASBESTOS PRODUCTS, ETC.

ESTIMATES FURNISHED AND CONTRACTS EXECUTED.

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catalogue is a comparison of the roofing on two buildings, one having 130 squares of 3-ply J-M asbestos roofing at $3.00 per square, and the other having 210 squares of 3-ply wool felt roofing at $2.25 per square. The latter, during a period of 8 years, needed painting twice, making the total cost $850.50, while the J-M asbestos roofing reached a cost of $390, leaving a difference in favor of asbestos roofing of $440.50 or $1.05 per square. A series of illustrations show the effect of a blow torch upon asbestos roofing and upon felt roofing. In the case of asbestos roofing, an exposure of 50 min, failed to damage the material, while the felt roofing was burned through in 5 min. Size 6½x5½ in. Pp. 16.

Cold Storage Insulation Specialties, made by the H. W. Johns-Manville Co., New York, are made, as stated in a recent circular issued by the company, for all classes of cold storage construction, ice making and refrigerating plants, breweries, packing houses, etc. Special attention is called to the National compressed sheet cork, in blocks 12 in. x 36 in. and all thicknesses; also to the company's line of impregnated cork board, J-M indurated fibre sheets, Keystone hair insulator, mineral wool blocks and mineral wool.

J-M Permanite Sheet Packing, especially designed for superheated steam and high pressure, are described in a characteristic circular, with a cover illustration in colors of the Pyramids, published by the H. W. Johns-Manville Co., New York. This packing is so constructed, both rubber and asbestos being combined in its makeup, that it has nearly the same resiliency and pliability as rubber sheet packing and can, therefore, be readily used on rough and uneven flanges. It has been found to successfully withstand a temperature of 1000° F. and is especially adapted for steam cylinders, steam chests, steam and ammonia lines, etc. J-M Permanite sheet packing is furnished in sheets 54 in. x 56 in. and is listed at $2.00 per pound.

"The Standard" Direct and Alternating Current Fans and "The Standard" Motors and Generators are the titles of two elaborate catalogues, issued by the makers, the Robbins & Myers Co., Springfield, O., and 145 Chambers St., New York. The fan catalogue includes ceiling fans, desk fans, bracket fans and oscillating desk fans and exhaust fans for direct and alternating current circuits and covers a remarkable variety of each type, with complete list prices. A separate

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Heating Systems
And for Every Service. Write for Catalogue

The Mason Regulator Co.
Boston, Mass.

CLASS A RETURN TRAP

—ESTABLISHED 1870—
The Albany Steam Trap Co.
ALBANY, N. Y.
Manufacturers of
RETURN STEAM TRAPS, NON-RETURN STEAM TRAPS, PUMPS, PUMP GOVERNORS. ALSO HIGH GRADE STEAM VALVES
Our 37 years' experience in this line is worthy of your attention

JAMES H. BLESSING
President

THOMAS F. RYAN
Sec. and Treas.

booklet contains net trade prices and terms of sale. The motor catalogue is dated March, 1909, and is a profusely illustrated book containing all the types of electric generators and motors made by this company, showing their use, not only for ordinary operating purposes, but for special applications, such as in connection with grinders, electric hand drills, lathes, sewing machines, etc. Size of fan catalogue, 8x10¼ in. Pp. 40. Size of motor catalogue, 6x9 in. (Standard). Pp. 32.

Inside Facts About Hot Blast Heater Coils, with special reference to the Green patent air heater, using steam or hot water, is an interesting booklet published by the Green Fuel Economizer Co., Matteawan, N. Y., and devoted to the new type of heater lately brought out by this company (illustrated in our January, 1909, issue). "Air and water within the pipes," says the author, "are the bane of hot blast heater coils and radiators." The writer then takes up the matter of air circulation in the new Green heater, showing how the current of steam must flow straight ahead through half the tubes, then back through the other half down to the bottom outlet, driving before it any air or water that may be present. Views of the Green heater are shown in photographic and sectional views, while the entire cover of the booklet is a clever reproduction of the headers of sections of the heater. Size 3½x5½ in. Pp. 16.

Modern Pressed Iron Radiators, a booklet issued by the Pressed Radiator Company of America, New York branch, 227 Fifth Avenue, shows the latest models of the company's standard and wall radiators, followed by a list of installations of Kinnear pressed radiators in New York city, Long Island and Staten Island, New York State, New Jersey and Pennsylvania, the list being an impressive one and testifying eloquently to the successful use of this type of radiation.

Automatic Draft Control for Steam Boiler Furnaces, is a pamphlet issued by The Green Fuel Economizer Co., of Matteawan, N. Y., describing an improved appliance recently brought out by that concern for so regulating the draft of steam boilers that the pressure within the fire-box is at all times neutral. To accomplish this end just enough pressure is supplied under the grates to force the air through the fuel, while enough draft is applied in the smoke flue to draw the gases of combustion through the boiler. This is said, not only to give the ideal proportion of air for perfect combustion at all loads, but also to prevent the escape of flame and hot gases of combustion through the open fire-door and through crevices in the brick-setting as where forced draft is used, while also preventing the drawing in of cold air and the dilution and consequent cooling of the gases of combustion, as where induced draft only is used.

This system of draft has an important bearing in connection with the researches which have recently been made by the engineers of the United States Geological Survey with the object of increasing greatly the rate of steam production per square foot of heating surface in steam boilers.

Miscellaneous Notes

Fred H. Davis, formerly of the Davis & Roesch Temperature Controlling Co., has become associated with the National Regulator Co., temperature regulation engineers, and manufacturers of dampers and hot water and pressure regulators, West Street Building, New York.

John Gormly, Philadelphia, Pa., a well-

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The Gorton Quick Opening Steam Radiator Valve

One third of a turn of the lever handle will open or close the valve

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known heating engineer and former president of the American Society of Heating and Ventilating Engineers, was honored by the master plumbers of Philadelphia, May 6, on the occasion of his retirement from the trade, by the presentation of a set of engrossed resolutions expressing appreciation of the Association for his successful efforts on behalf of the trade during his long and active career.

Walter B. Snow, 170 Summer St., Boston, announces the Association with his staff of Carl S. Dow, S. B., engineering department, Harvard university, late publicity manager, B. F. Sturtevant Co., and formerly in charge of instruction and text book departments, American School of Correspondence. Mr. Dow brings to the organization a diversified experience which will add materially to the value of the service rendered in all lines of technical publicity.

Jacob A. Harman, 120 Fredonia Ave., Peoria, Ill., announces that John J. Harman, mechanical engineer (University of Illinois) has become a member of the Harman Engineering Co. In addition to surveys and civil municipal and drainage engineering, the firm will give particular attention to mechanical engineering problems including examinations, reports, designs and tests of steam, hydraulic and gas-driven electric generating plants, and determination of mechanical efficiencies of manufacturing processes and machinery.

Madison, Wis.—The ninth session of the summer school for artisans of the University of Wisconsin begins June 28, continuing for six weeks. Courses are offered in steam and gas engines, electricity, machine design, mechanical drawing and allied subjects. The course in engines and boilers covers the theory of heat, steam engines and boilers; calibration of instruments; operation and testing of steam engines and boilers; gas engines and gas producers, and compressed air. There are no entrance requirements, the purpose of this school being to offer practical instruction by lectures and laboratory practice to young men in the trades. Certain advanced engineering courses are offered for those having the requisite preparation, and the general university summer session held during the same period allows opportunity for a wide choice in subjects of instruction. A new feature of the coming session will be courses in public utilities testing and accounting, for those desiring to become familiar with the requirements of the railroad commission of Wisconsin which has the administration of the Wisconsin public utilities law. Information may be obtained from F. E. Turneaure, Dean, College of Engineering, University of Wisconsin, Madison, Wis.

William T. Isaac, vice-president and general manager of the Gurney Heater Mfg. Co., Boston, and Edward Gurney, president, accompanied by his son, Cromwell Gurney, are in England enjoying a two months' automobile tour which will take them through England, Scotland and France.

Crawfordsville, Ind.—The city council has granted a franchise to the Central Station Engineering Co., of Chicago, granting it the right to build and put in operation in Crawfordsville a central station hot water heating plant. The franchise runs for 25 years and provides that

DIXON'S PIPE - JOINT COMPOUND

for all threaded or flanged connections. Makes tight joints, but never sets. Write for booklet and free sample 211 - D

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heat shall be furnished at the rate of 17 cents per square foot of radiation. The plant will be operated by the Crawfordsville Heating Co. which is to be organized. The power house will be located at the north end of Water street, adjoining the Monon Railroad and will cost $15,000. The proposed capitalization of the operating company is $140.000 of which $70,000 will be stock and $70,000 bonds. It is proposed to provide for about 300,000 sq. ft. of radiation, of which it is estimated 100,000 sq. ft. will be contracted for at once.

Jamestown, N. Y.—The possibility of operating a municipal heating plant in connection with the municipal electric and water works plant, utilizing exhaust steam for heating, is under consideration.

Building Operations for April continued to show an increase in all sections of the country, the largest percentage of increase being reported in the Eastern cities, and more particularly in New York, due to the general desire to file building plans before the new building code goes into effect. The figures in New York are $25,525,079 as against $15,929,746 for the same period last year. The eastern cities show an increase of 68 per cent; middle west, an increase of 26 per cent; Pacific coast, an increase of 58 per cent; and southern cities, an increase of 3 per cent.

New Incorporations

Arthur D. Little, Inc., laboratory of engineering chemists, 93 Broad street, Boston, incorporated to extend its laboratory facilities. The company announces that it is prepared to undertake any work involving the application of chemistry to industry. Dwight T. Randall, who has lately had charge of the

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Are Incomparably the Best for Health, Comfort and Economy
They Combine all Advantages of Other Systems
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Slotted Angle Flanges will make any angle up to and including ten degrees. Any angle up to the maximum can be made simply by shifting the two flanges to the desired position. The slot in the bolt circle gives bolt hole for any position, and after adjusting to the desired angle fitting is made up in usual manner.
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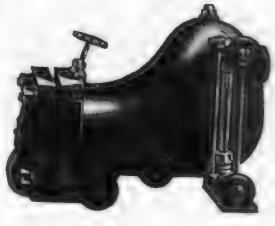
When you need a Steam Trap buy one you know will work. With a McDANIEL we take all the chances. Don't pay until you are satisfied. We have been 25 years manufacturing Steam Traps and know there is no better trap made. May we send you one for trial?
Watson & McDaniel Co.
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Send for Catalogue

fuel tests conducted by the Technologic branch of the government Geological Survey, has associated himself with Arthur D. Little, Inc.

Edward Joy Co., Syracuse, N. Y., capital $300,000, to carry on the steam and hot water fitting contracting business of Edward Joy. The company will engage in electric, plumbing, steam and hot water fitting contracting. Incorporators: E. Joy, E. F. Joy and P. R. Joy.

Waterman-Woodbury Co., Buffalo, N. Y., capital $300,000, to manufacture heating and ventilating apparatus. Directors: Peter L. Pease, John T. Gething, and Frank B. Waterman. Other stockholders are James L. Waterbury and Clyde Waterman of Minneapolis, Harvey A. Schofield, of Neillsville, Wis.

Yakima Central Heating Co., North Yakima, Wash., capital $100,000, to operate a central station hot water heating system.

Thomas T. Knight Co., Rockville Centre, N. Y., capital $100,000, to manufacture heating and plumbing supplies. Incorporators: Paul Ayres, Oceanside, N. Y.; Edward A. Hall and Harold C. Strong.

Owen-West Plumbing Co., Ridgewood, N. J. Capital stock, $10,000. Incorporators: Alfred Owen, William Test and Philip I. Hover.

Central Tube Co., Pittsburg, Pa., capital stock, $350,000, incorporated by interests formerly associated with the Pittsburg Steel Construction Co. The new corporation has purchased the construction company's property, consisting of 14 acres, at Economy, Pa., for manufacturing purposes. President, Alexander Laughlin; vice-president, C. W. Coffman; secretary and treasurer, C. C. Pease.

Manufacturers' Notes

Fowler & Wolfe Mfg. Co., Philadelphia, announces that it has begun suit against the McCrum-Howell Co., in the U. S. Supreme Court for the southern district of New York, on account of alleged infringement on the Fowler & Wolfe wall radiation patents.

Carrier Air Conditioning Co. of America, New York, has incorporated with a capital stock of $250,000, to operate and authorize others to use air washers and purifiers. Incorporators: W. F. Wendt, H. W. Wendt and W. H. Carrier.

American Radiator Co., Chicago, is converting the foundry of the Birmingham Pipe & Casting Co., into a radiator plant. The contracts have been let.

American District Steam Co., Lockport, N. Y., will build an addition to its machine shop 104x260 ft. which will double its machine shop capacity.

New Firms and Business Changes

E. Rutzler Co., New York, contractors for steam power, steam and hot water heating and ventilating systems and also manufacturers of a number of heating specialties have moved into its new building at 404-408 East 49th street.

E. Best Plumbing & Steam Heating Co., Quincy, Ill., has increased its capital stock from $10,000 to $50,000.

F. G. Sanford & Co., 822 Eagle Ave., Bronx, New York, is a new heating firm composed of F. G. Sanford, formerly with A. B. Barr & Co., Yonkers, N. Y., and H. W. Sanford.

CENTRAL STATION AND INDUSTRIAL HEATING PLANTS
THE SCHOTT SYSTEMS

INDESTRUCTIBLE

UNDERGROUND CONDUIT AND INSULATION. GREATEST CAPACITY, EFFICIENCY AND HIGHEST CLASS OF CONSTRUCTION ARE THE DISTINCTIVE FEATURES THAT MAKE

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"THE POTTER" MESH SEPARATOR

OR BOILER DRY-PIPE

DRY STEAM—SAFETY—ECONOMY

POTTER SEPARATOR CO., Newburgh, N.Y. N.Y. OFFICE: 39 Cortlandt St.

Burns Bros., Syracuse, N. Y., has been organized to conduct a heating and plumbing contracting business at 409 Washington treet. The firm is composed of J. R. Burns and T. H. Burns, late with Edward Joy.

Contracts Awarded

Buffalo Forge Co., Buffalo, N. Y., reports an unusual order for eight fans, with 7-ft. wheels at 380 R.P.M., for the cold storage warehouses operated by the Pacific Fruit Express Company at Roseville and at Colton, Cal. The order was forwarded by the Pacific Engineering Co., San Francisco. Each fan was to deliver 44,500 cu. ft. of cold air against a pressure of 3 oz. per square inch and to be of full housing type, with bearings supported on concrete piers, with the blast wheels overhung on the shaft and with stuffing boxes on the fan housings to prevent the leakage of air. Although special in several particulars the Buffalo Forge Co. undertook to fill the order by making shipment of four of the fans in ten days and the balance fifteen days later. As the entire shipment weighed 32,000 lbs. the advantage in freight on account of shipping in one car was considerable, so that it was decided to make a special effort to complete the eight fans in the time promised for the first four. Shop drawings were not started

Prevents Pipes Sweating

Much damage is done to walls, wall paper, furniture and merchandise in hot weather by the sweating of cold water pipes.

This can be entirely prevented by covering the pipes with

ANTI-SWEAT Pipe Covering

This covering is made of layers of corrugated wool felt and waterproof insulating paper, with canvas jacket. It is furnished in 3 ft. lengths with metal bands for applying.

Here's a chance for you to make extra money. **NOW** is the time to get after this business. We will help you by furnishing attractive advertising matter with which you can circularize your trade.

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until receipt of the order, but preliminary notice was sent to the factory and by the time that prints were received by the various departments, much of the material had been gotten ready. On the tenth day after the order was received, shipping was commenced and by that night, the eight fans, with shafts, pulleys, and outboard bearings, were loaded on a 42-ft. gondola.

Malcolm W. Hill Co., Philadelphia, heating addition to U. S. Postoffice in Baltimore; also heating new laboratory of the National Bureau of Standards in Washington; two company and band barracks at Fort DuPont, Del.; U. S. Naval Hospital, Philadelphia; and electric power plant piping at Fort Monroe, Va.

Thos. E. Gildea, Syracuse, N. Y., heating and electrical work for the County Home buildings in Syracuse.

Pressed Radiator Company of America, Pittsburg, Pa., recently shipped to the Japanese Government, over 30,000 sq. ft. of radiators to be used in the Marine Hospital, erected at Osaka, which is the largest hospital ever erected by the Japanese government.

John R. Sheehan, Schenectady, N. Y., heating and ventilating system for new Schenectady County court house for $19-869.

Edward Joy Co., Syracuse, N. Y., power plant, heating, ventilating, plumbing and lighting for the 12-story Onondaga Hotel. The contract amounts to $130,000.

Memphis Heating Co., Memphis, Tenn., vacuum steam heating for $1,000,-000 court house in Memphis.

Wanted

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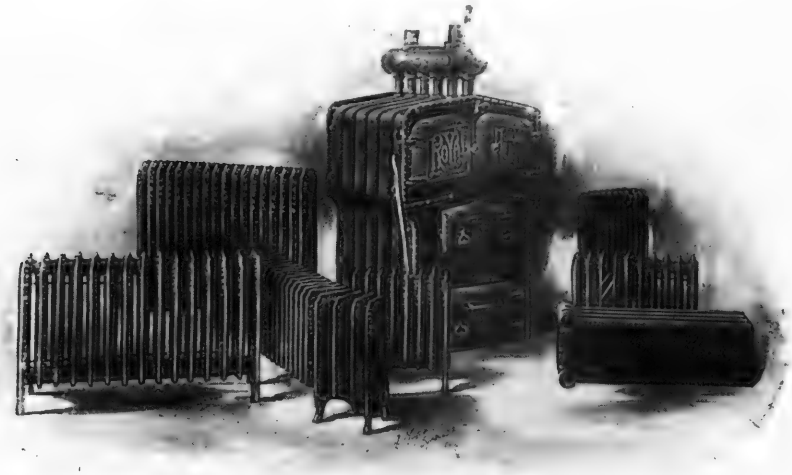

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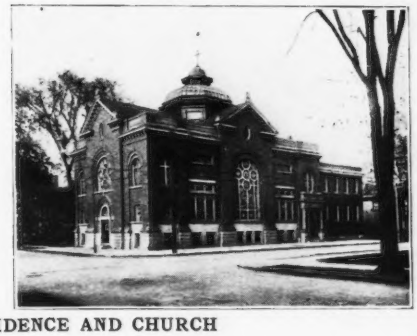

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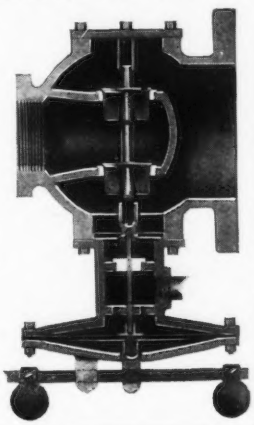

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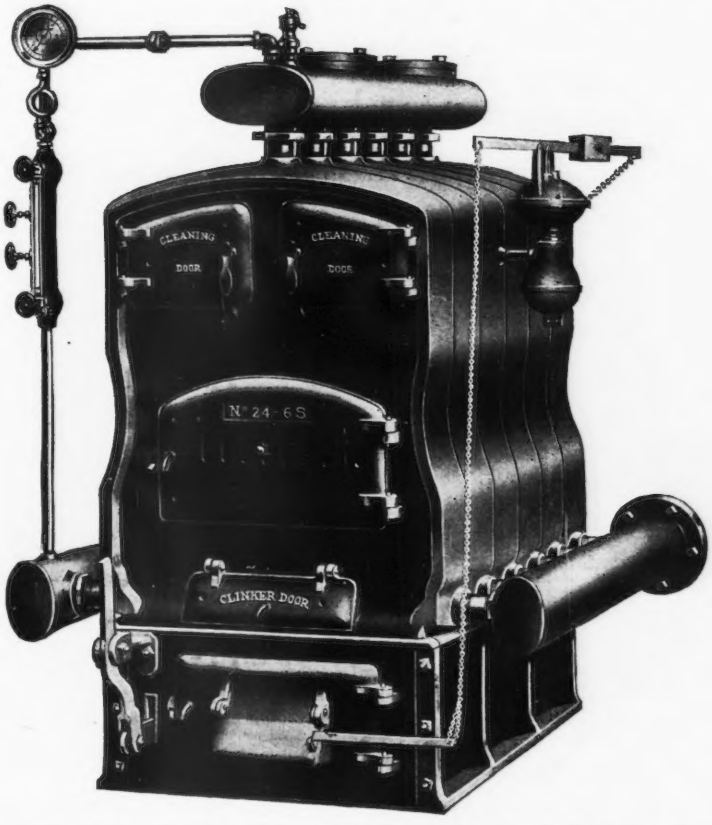

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